AMD'S **HOT NEW K6-III** IS PUT TO THE TEST

MAXIMUM PC

► **MINIMUM BS**

APRIL **99**

OVERCLOCKING: TURBO CHARGE YOUR OLD PC

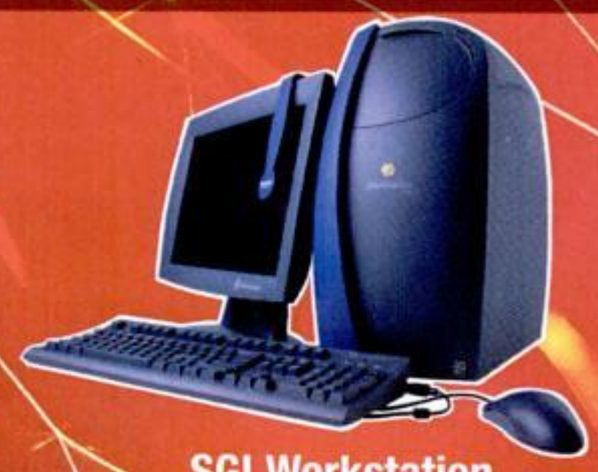
► **HOW TO** ADD UP TO 150MHz OF **RAW SPEED** AND NOT SPEND A SINGLE DIME!

Reviewed Inside:
- ►52x CD-ROM Drive
- ►Iomega Zip 250
- ►USB Modems
- ►Rio MP3 Player

PLUS: SGI's Raging Dual 500MHz P-III NT Workstation is Here

AOpen 48x CD-ROM

Diamond Rio



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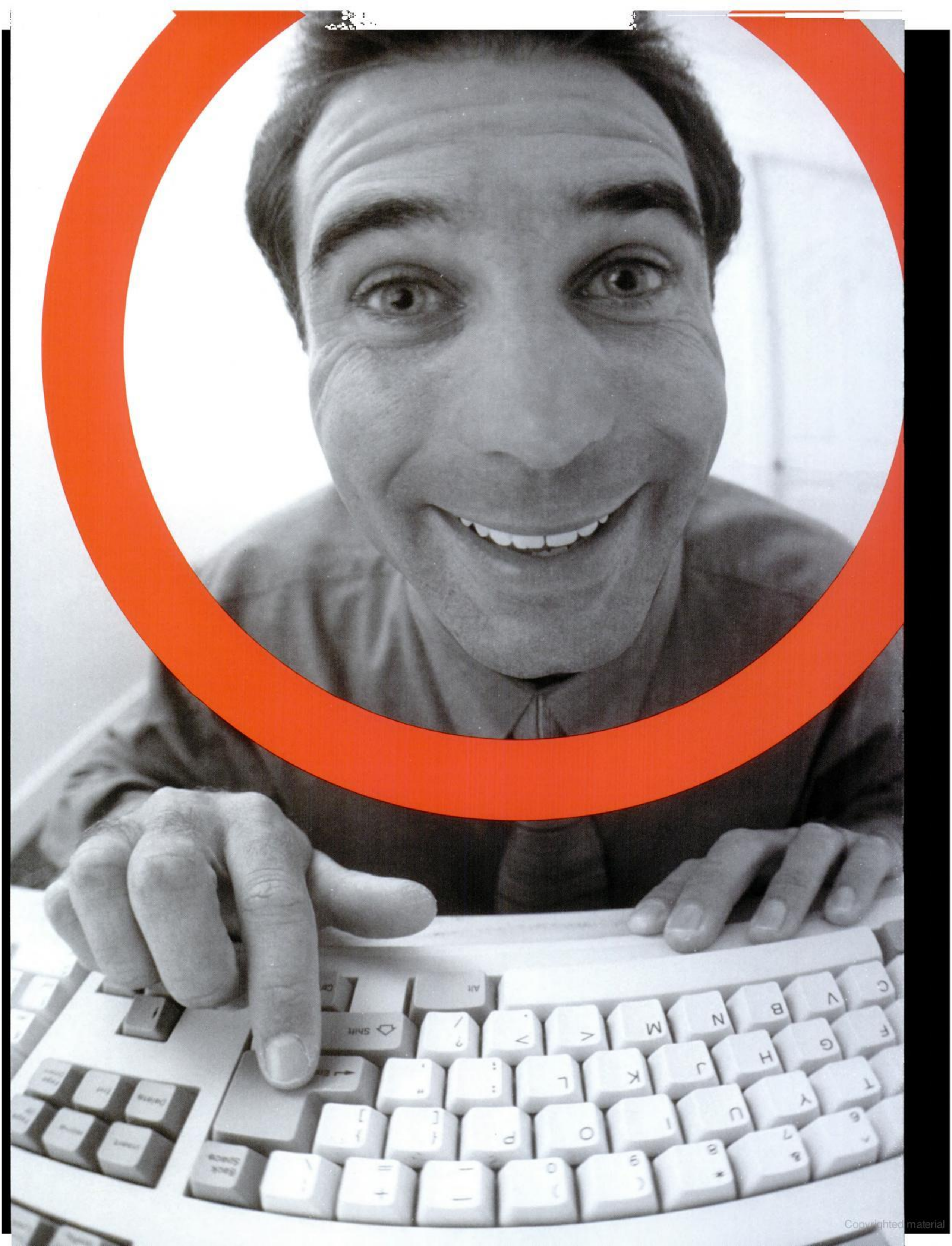

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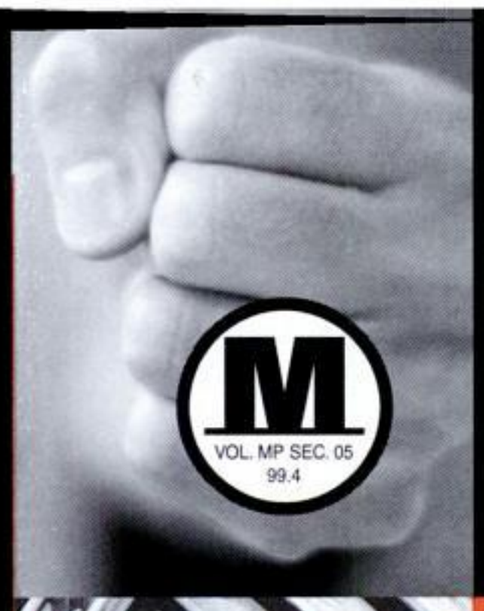

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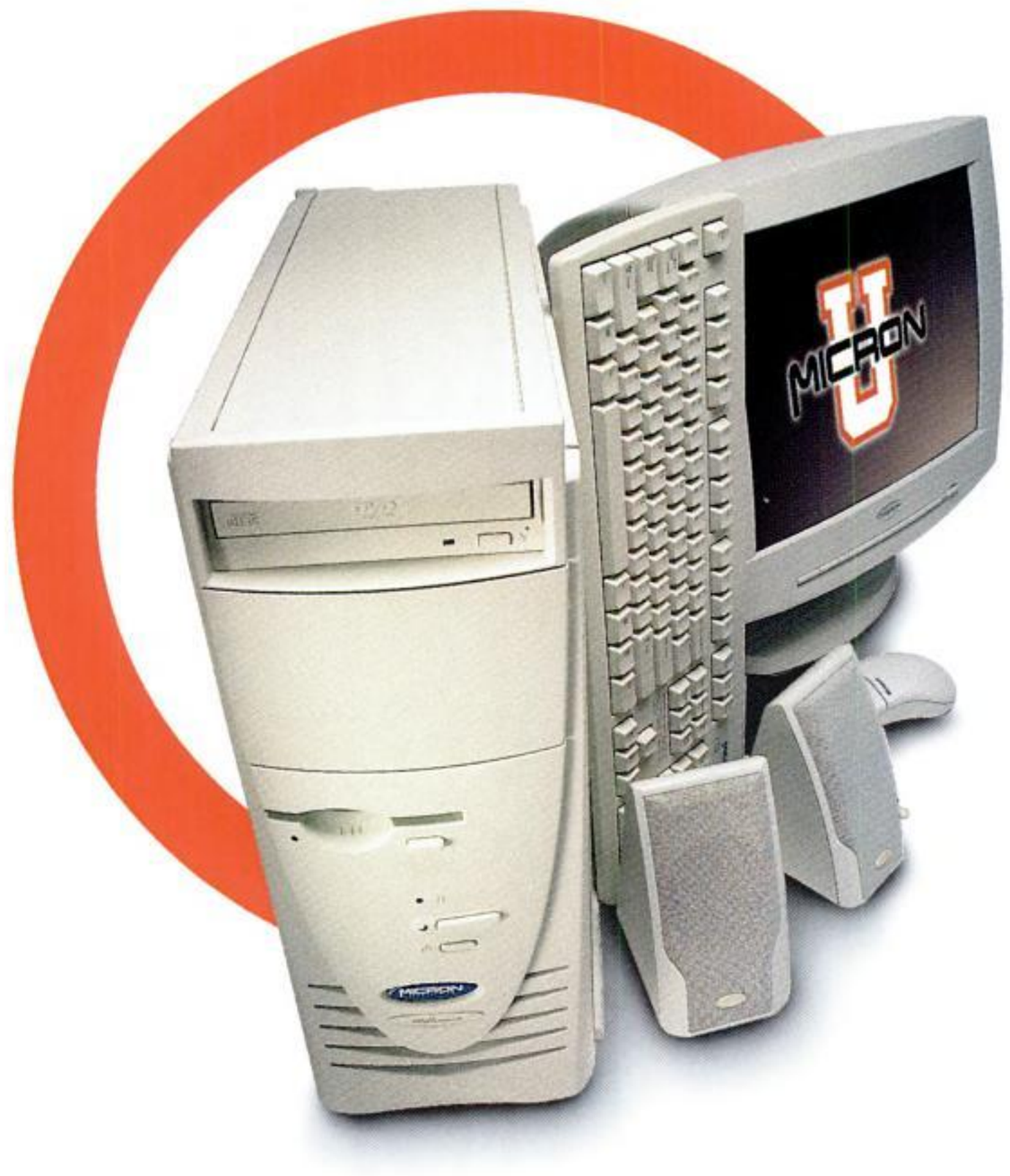

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Processor	Intel Celeron™ processor 400MHz	Intel Pentium II processor 400MHz	Intel Pentium III processor 500MHz	Intel Pentium III processor 500MHz	Intel Pentium III processor 500MHz
Cache	128KB internal L2 cache	512KB internal L2 cache	512KB internal L2 cache	512KB internal L2 cache	512KB internal L2 cache
RAM	64MB SDRAM	64MB 100MHz SDRAM	64MB 100MHz SDRAM	128MB PC100 SDRAM	128MB 100MHz SDRAM
Hard Drive	8.4GB Ultra ATA hard drive*	13GB Ultra ATA hard drive*	13GB Ultra ATA hard drive*	20GB Ultra ATA hard drive*	25GB Ultra ATA hard drive*
Monitor	17" Micron 700Vx monitor (15.9" display)	17" Micron 700Vx monitor (15.9" display)	17" Micron 700Vx (15.9" display) monitor	17" Micron 700Vx (15.9" display) monitor	15" Micron LCD flat panel display
DVD/CD-ROM	40X CD-ROM drive°	40X CD-ROM drive°	40X CD-ROM drive°	6X max speed DVD ROM drive	6X max speed DVD-ROM drive
Modem	3Com USRobotics V.90 WinModem**	3Com USRobotics V.90 WinModem**	3Com USRobotics V.90 WinModem**	3Com USRobotics V.90 WinModem**	3Com USRobotics V.90 WinModem**
Graphics	8MB AGP graphics nVidia Riva 128 ZX	8MB Real 3D Starfighter AGP graphics	16MB Diamond Viper 550 TnT 2X AGP graphics	16MB Diamond Viper 550 TnT 2X AGP graphics	16MB Diamond Viper 550 TnT 2X AGP graphics
Sound System	PCI 64-voice Wavetable sound	PCI 128-voice Wavetable sound	PCI 128-voice Wavetable sound	PCI 128-voice Wavetable sound	Sound Blaster LIVE! Value audio card
Speakers	Advent AV009 speakers	Advent AV009 speakers	Advent AV009 speakers	Advent AV009 3-piece speaker set	Monsoon 3-piece flat panel speaker system
Warranty	5-year/3-year Micron Power™ limited warranty	5-year/3-year Micron Power limited warranty	5-year/3-year Micron Power limited warranty	5-year/3-year Micron Power limited warranty	5-year/3-year Micron Power limited warranty
Training	1-year free^ training @ Micron U online	1-year free^ training @ Micron U online	1-year free^ training @ Micron U online	1-year free^ training @ Micron U online	1-year free^ training @ Micron U online
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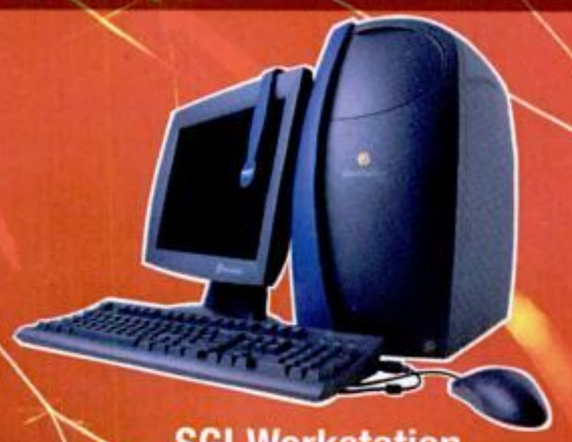

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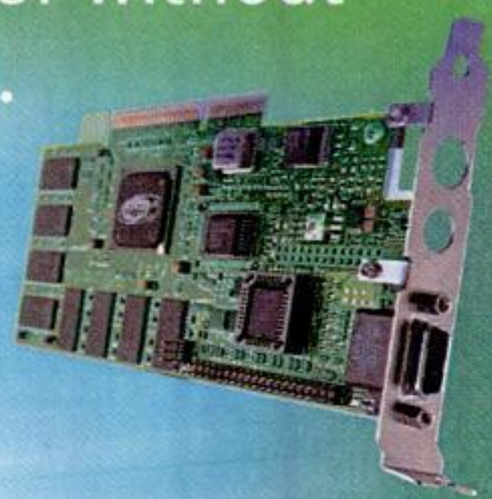

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16-bit	STB VELOCITY 4400 (RIVA TNT) 60 fps
32-bit	44 fps
16-bit	CREATIVE 3D BLASTER (VOODOO II) 59 fps
32-bit	Not Supported
16-bit	DIAMOND MONSTER FUSION (BANSHEE) 44 fps
32-bit	Not Supported

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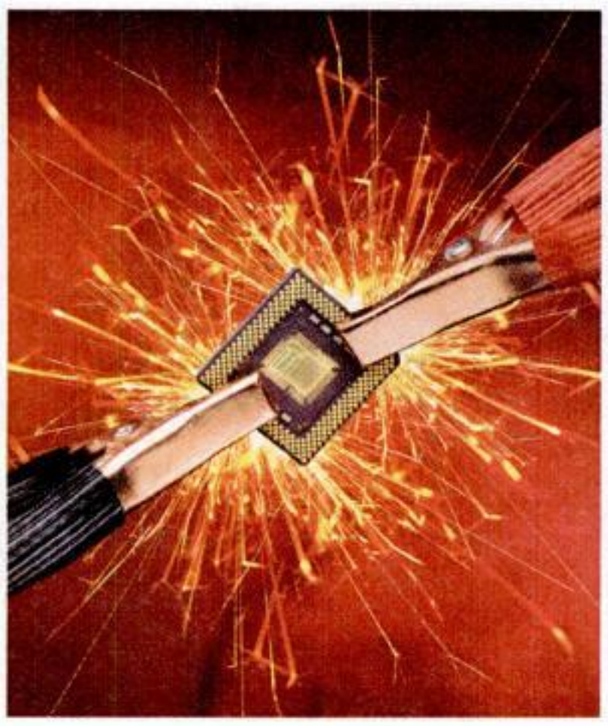
MAXIMUM PC

► APRIL 1999



50 Operation: Overclock

Learn the burn of clock speeds unleashed! And turn your 300MHz priss-boy of a CPU into a 450MHz Finnish power-lifter. Four case studies describe how to overclock everything from a Pentium 200 to a TNT videocard. But before you toss your silicon into the fire, give it some cool lovin' with one of the heatsinks that we put on ice.

59 AMD K6-III: Third Time's a Charm

AMD finally has a chip that can go with Intel's finest. The K6-III is throwing an L2 cache surprise party, and you're invited to throw down with integer power to spare. Here's the scoop on how the latest X86 processor design will change your life.

44 Interrogation: nVidia

Voodoo² was the bomb—last year. It's 1999, and nVidia Vice President Dan Vivoli still isn't sweating. Why? Because he's holding the fuse to two dynamite technologies: TNT2 and NV10—both of which he says are powerful enough to blow 3Dfx, and the yet-to-be-released, but already maligned, Voodoo³—to smithereens.

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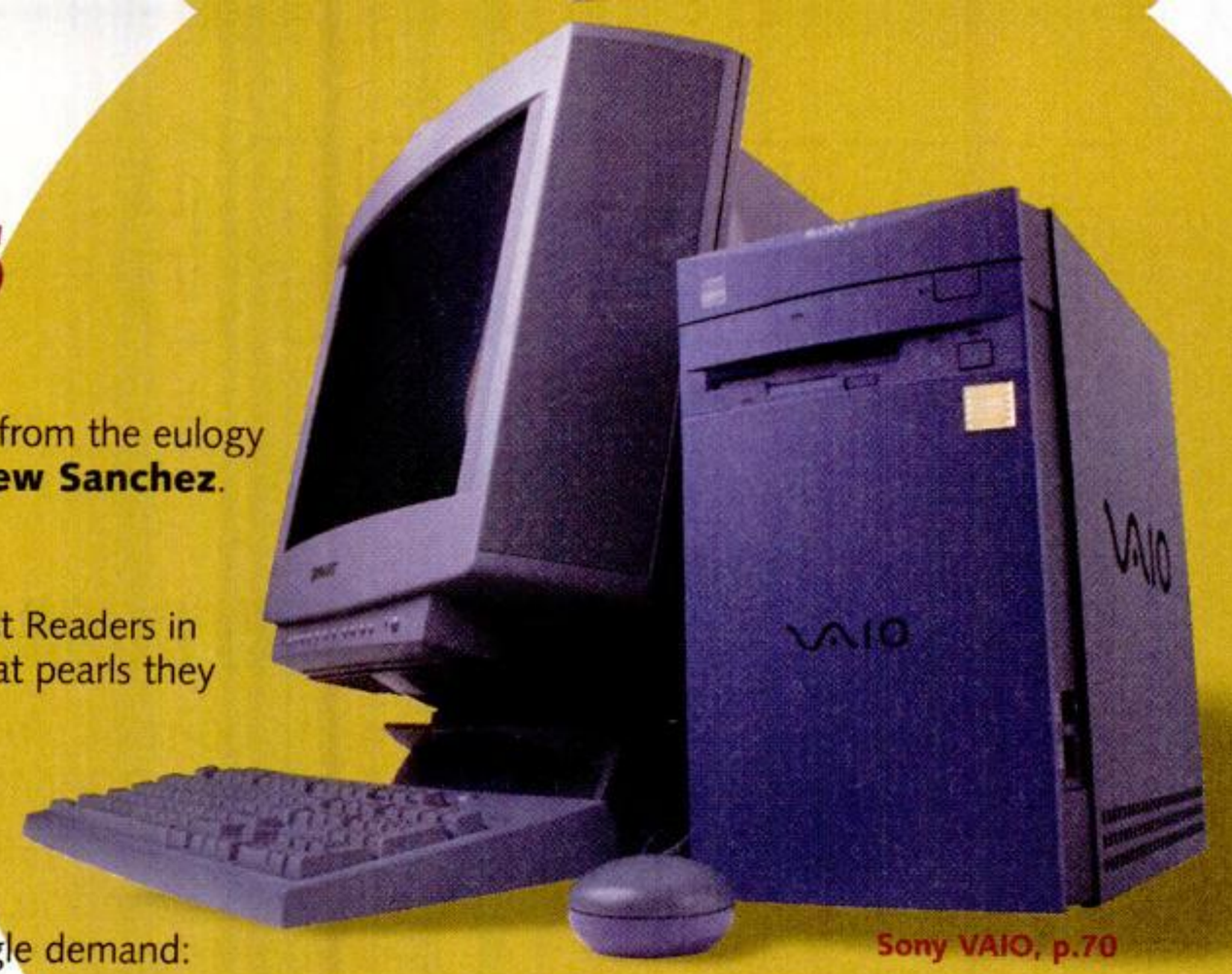


Sony VAIO, p.70

▶ TECH FILES

30 Watchdog
Have you been mistreated by a manufacturer? The **Watchdog** investigates your consumer complaints and then bites the thighs of those who've wronged you.

62 Ask the Doctor
Is your hard drive wheezing? Does your videocard spew discolored phlegm? Just let the **Doctor** diagnose your PC problems and prescribe a remedy for PC bliss.

99 Terminator
You know those underlined words strewn about the magazine? We explain them here.

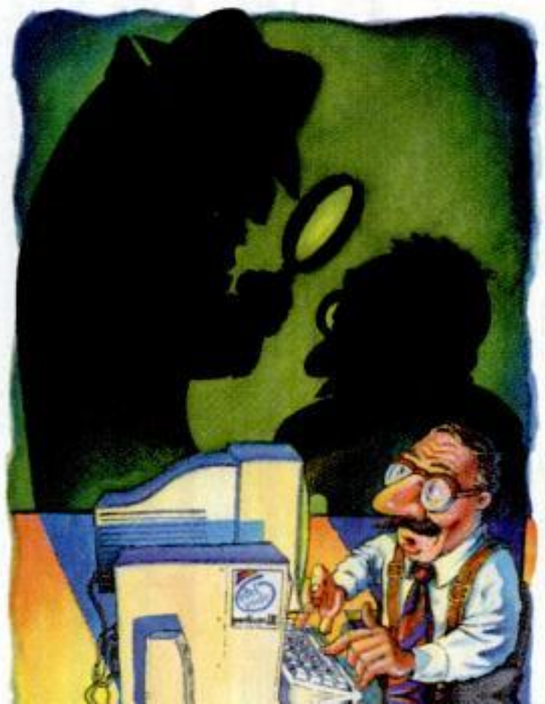
▶ NEWS

24 Inside Sources

News for discriminating tech-heads

► Intel has put an extra little something in its just-released Pentium III—a processor serial number. Does this controversial feature really help secure the human race, or is Intel just interested in playing a game of "I-Spy With My Little Eye" to grab your personal data?

► **Also:** Windows expatriates demand refunds for an OS they never wanted in the first place. **Plus**, we get the scoop on Bitboyz Oy's upcoming Glaze3D, a 3D graphics chip that will have its coming out party later this year.



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▶ PRODUCTS

33 Peripheral Vision
High-tech toys on the PC periphery, including Sega's hot new Dreamcast and the latest megapixel monster from Olympus.

64 Previews
3Dfx's **Voodoo³** blows the doors off our benchmarks but leaves us wanting more. **Also**: **System Shock 2** updates a gaming classic.

Diamond Rio, p.90

69 Reviews
We pound this month's hardware and software until it begs for mercy.

Highlights include: A first look at **SGI's** new dual-proc 500MHz **NT workstation**, the fastest CD-ROM drives on the planet, $99 **software video editors**, Iomega's **250MB Zip drive**, fly **music applications** that'll have you pumpin' grooves, and a slap in the face to Geffen as Diamond releases the **Rio MP3** player.

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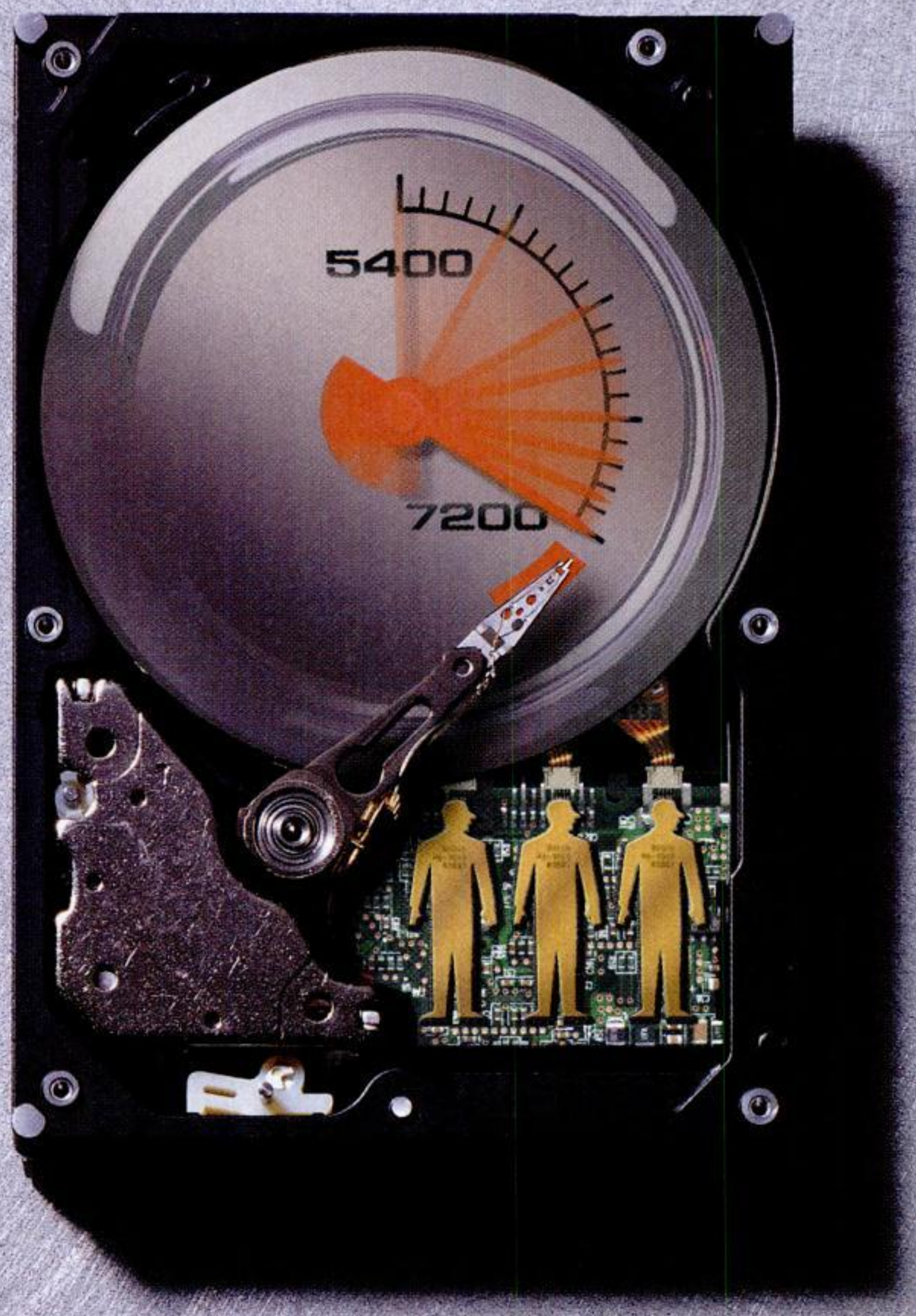
7200 RPM performance.



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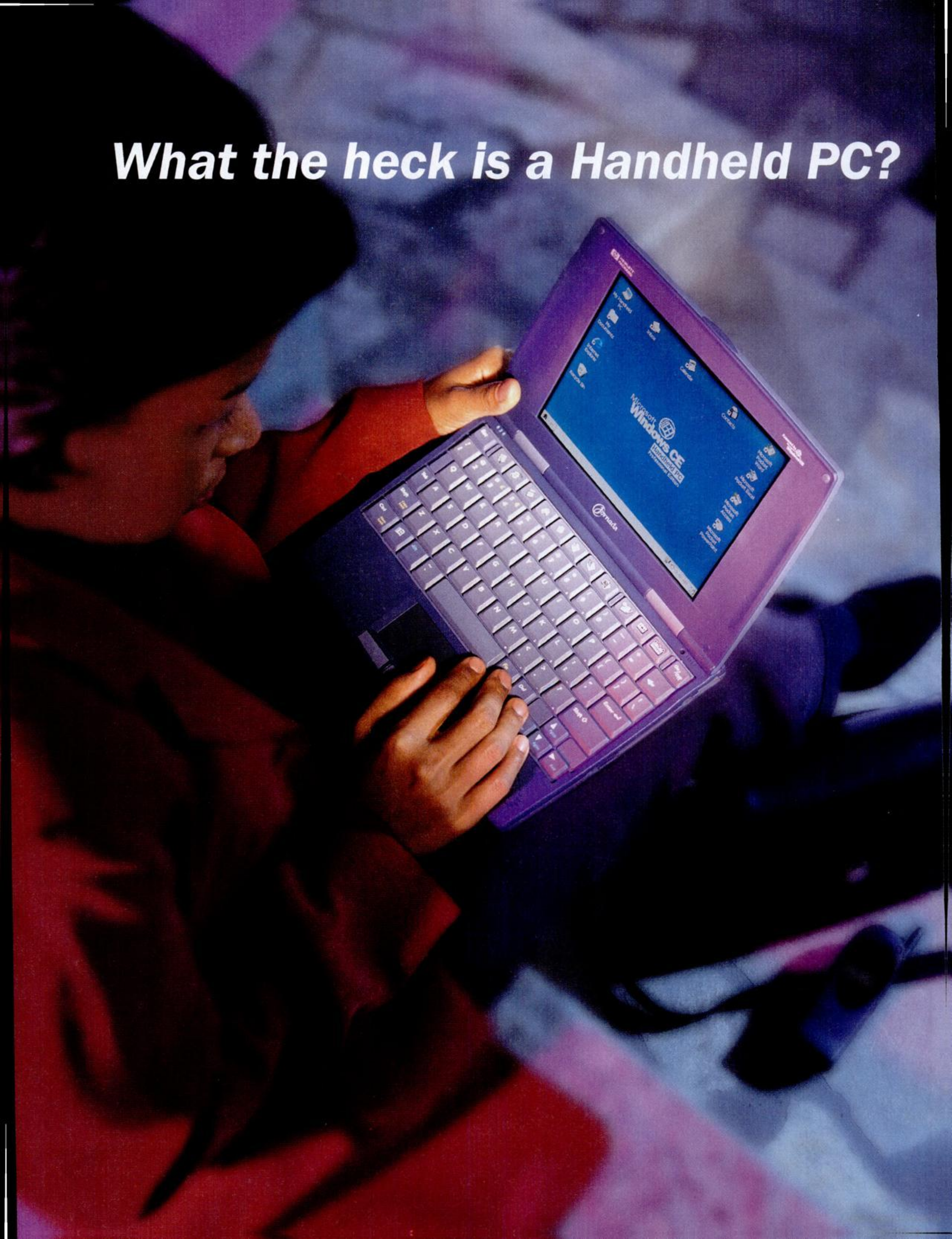

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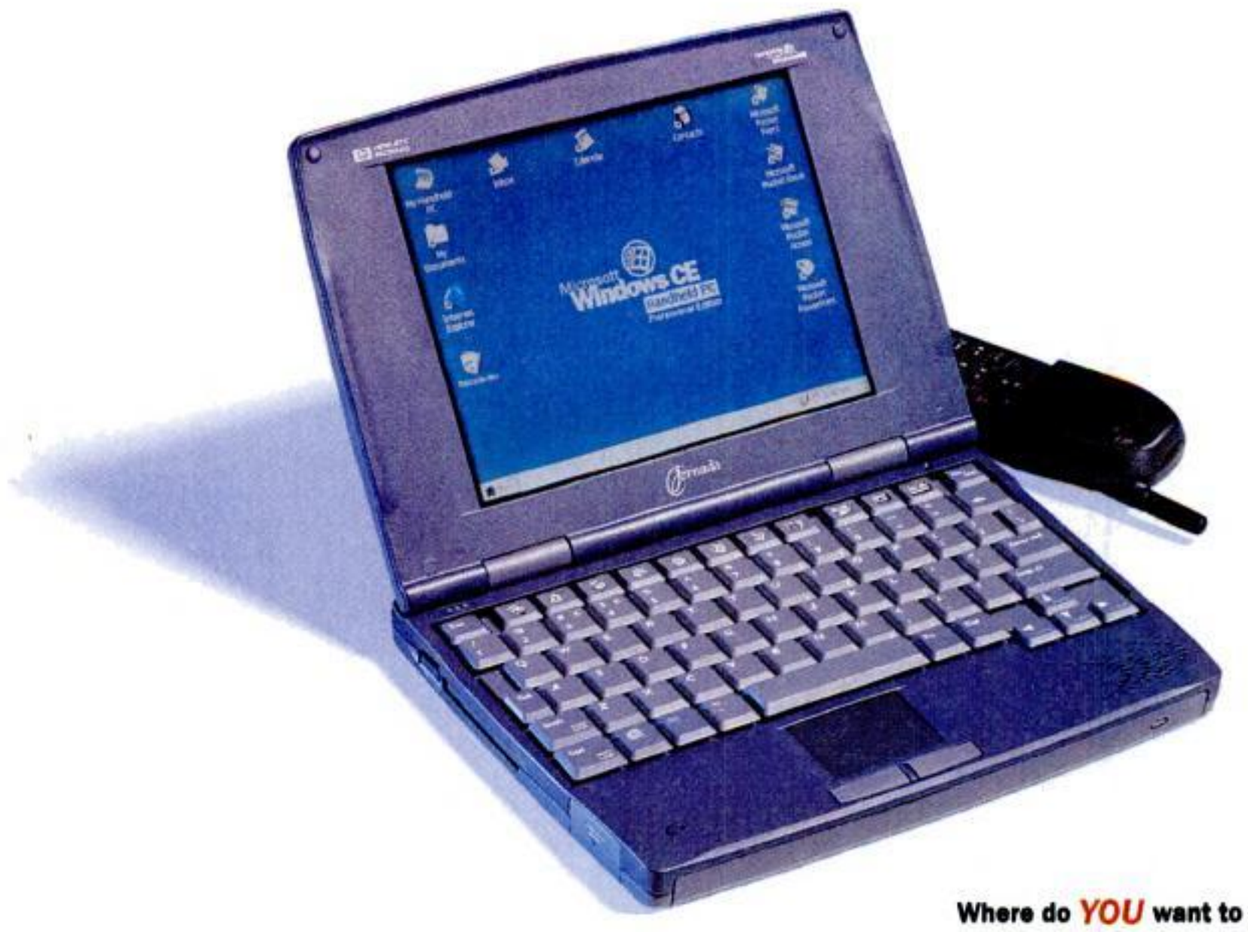

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Dedication

Andrew never compromised the integrity of a review—and it showed. Andrew Sanchez was, to borrow a phrase, "untouchable."

When first I met Andrew, who could have known the promise he held? I was just looking for someone to catch up on the filing in the office. Our intern, Francis Kong, was going back to school and we were in a bind. Francis recommended his best friend, and I hired him, I think his title was Associate Editor or some such, but really… he was here to file. It didn't take long for us to realize that Andrew wasn't going to be doing much filing. (In fact, this lack of filing is something that his desk is still testament to.) In the first issue that Andrew contributed to, he had a startling 11 reviews and previews.

Even then, Andrew exhibited the vibrant writing voice that would make him a favorite of the readers. Those first reviews included classic quips such as: "The IntelliMouse is like an appendix; it doesn't do any harm, but it's not good for much either." And in a level editor for the game *Descent* he wrote, "Creating new worlds is no easy task. Just ask God." And his review of a *Duke Nukem 3D* expansion pack promised that you could "cook more gooey aliens than Sigourney Weaver having a bad hair day." This prolific, and colorful, start would foreshadow his eventual domination of the entire review well. Quickly, Andrew established himself as the backbone of the entire magazine, tackling all the toughest subject matters and handling even the most technical issues with wit and grace. He rose to the title of Reviews Editor, and eventually Senior Editor of the magazine.

As a person who loved all things that had to do with computers, Andrew was in seventh heaven. He tinkered with all the latest hardware. He played all the newest games. He created 3D worlds in the best software money could buy. He had the job every computer junkie joneses for.

But Andrew's rise was not simply due to his always brimming passion for the subject matter. Andrew's success was as much a result of his discipline. Many others dropped into Andrew's situation might squander the opportunity, lose track of the goal, and just play the days away. Andrew always understood our mission: Protect the magazine's readers and discover for them the absolute best experience they could have with their own PC. It is a selfless goal, and Andrew was a paragon of it. He always considered his reader first and foremost. When his contacts in the industry might call him up and ask some leniency on an upcoming review, just that Andrew might turn a blind eye to some flaw, just a little favor… Andrew stood his ground. Andrew never compromised the integrity of a review—and it showed. Readers recognized it. For the first time in memory, name-brand products were getting tough reviews. But everyone always knew they were fair and justified. That's the kind of person Andrew was. Andrew Sanchez was, to borrow a phrase, "untouchable."

Tragically, Andrew was suddenly taken from us February 6, 1999. He died in the hospital after being admitted for flu-like symptoms and shortness of breath. Tests are still underway to determine a cause of death, but no explanation will dull the hurt we all suffer from Andrew's premature departure.

Andrew Sanchez was the heart and soul of *Maximum PC*, and we dedicate this magazine to his memory and continue to fight the good fight, because that's what he would have wanted.

Brad "Big Daddy" Dosland
Editor in Chief

MAXIMUM PC

apr99 vol4issue4

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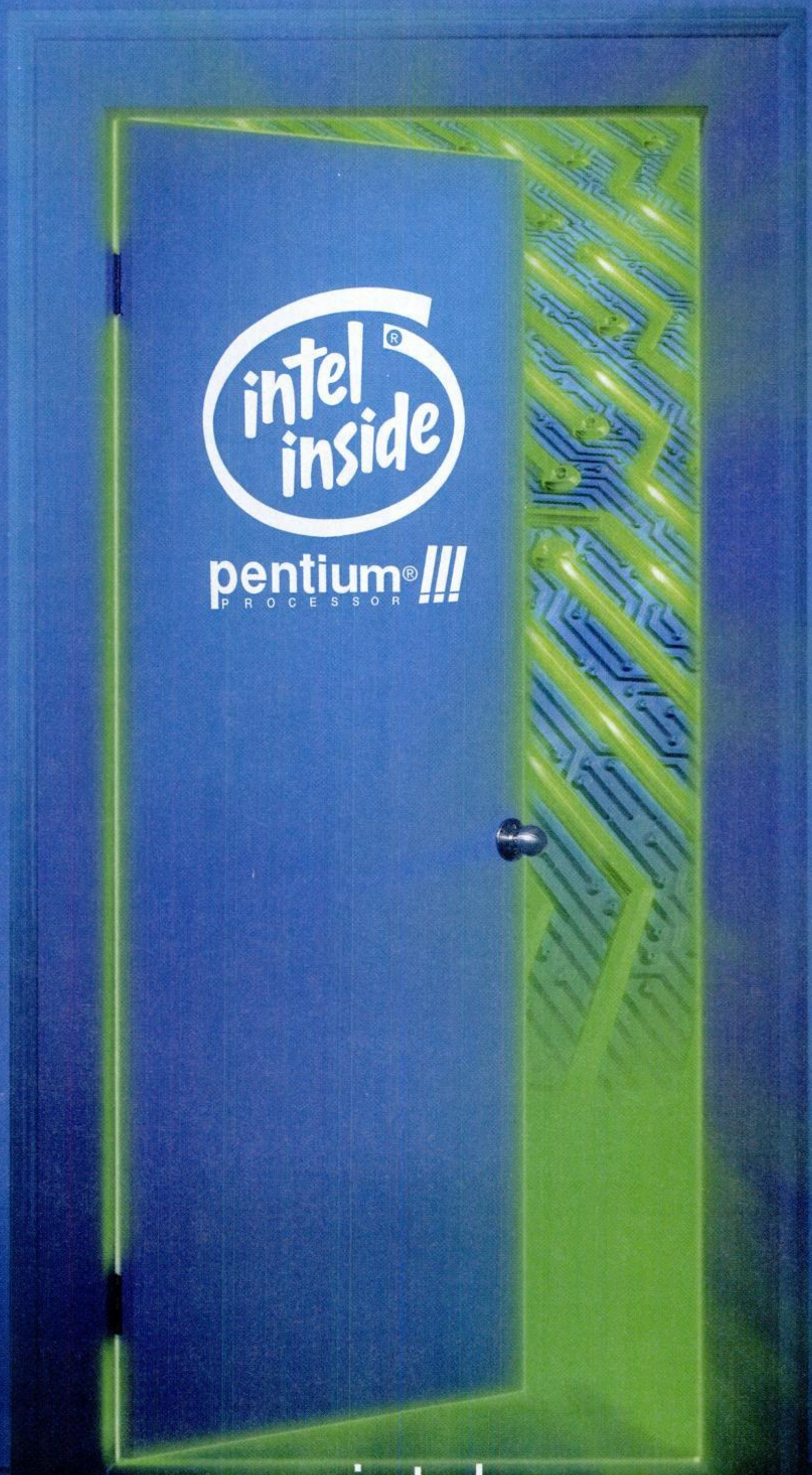

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Letters from the Smartest Readers in the World

Here's the deal: You (being the smartest readers in the world) write letters about the magazine, the PC industry, the software you love or hate, and the hardware that runs it. We read it and share as much of it as space permits in the mag and online, and respond or comment when the letter calls for it. Get it? Now get busy and write us at **commport@maximumpc.com.**

Can't Judge a Mag by Its Cover

What's the deal with the two different February covers? I bought my copy at a book store and it features a somewhat attractive female slinked over the top of a Compaq. A few days later I see on the shelf (also on the front page or your web site)the same edition, only it's a close-up shot of the champagne bottle being broken on a monitor. What gives?

—Tom Fisher

Art Director Kevin Ashburn replies: Test covers, Tom. We put two out there with the same premise, one to test the hardware response; the other, the "soft"ware response. Then we look at the sales numbers and see if people sell computer magazines better than computers. If they do (and we're not sure yet) you'll likely see more people on the cover. If they don't, my resume's off to *Maxim*.

Miss Ogynist, Miss Andric, and Miss Congeniality

As clergy of a conservative religious organization (which does not admit women to the ranks of clergy), I am by no means a feminist. Nevertheless, I think many of the pictures that appear in your magazine are—by reason of their character of being demeaning and degrading to women—ridiculous as well as absurdly anachronistic for any era but especially for this day and age. Pictures such as these foster the unhealthy attitude that women are mere sex objects rather than human beings with feelings. Consequently, they give rise to frustration and anger among women against male insensitivity and promote the growth of antisocial and misandric feminist organizations and movements.

—Candle12

Editor in Chief Brad Dosland replies: You're not alone in that sentiment. Feminist Andrea Dworkin shares your position. She once said, "It's very hard to look at a picture of a woman's body and not see it with the perception that her body is being exploited." Of course, I've always leaned toward the position of ACLU president Nadine Strossen, who says, "Far from advancing women's equality, this growing tendency to equate any sexual expression with gender discrimination undermines women's equality. Women are, in effect, told that we have to chose between sexuality or equality, between sexual freedom and economic, social, and political freedom."

Some readers have also complained that pictures of women with computers takes away from the serious business of computers. For my part, I don't believe that showing a person presenting a product inherently degrades either the person or the product, regardless of the person's gender. I know I haven't lost any respect for the alphabet as a result of Vanna White.

"I found a way to jack up your modem speed with a flat-head screwdriver."

Overclock Your Modem

I read in a previous *Maximum PC* that this was not possible—actually, the Doctor didn't know—but I found a way to jack up your modem speed with a flat-head screwdriver. You also need some needle-nose pliers.

1. Make sure you can see your modem. If it's a card modem, make sure it's fully connected. Voice modems must be connected to the soundcard for you to actually see the performance.
2. There should be jumper switches on the modem. I tried this on an older Intel 14.4 modem. The jumper switches may be set for Com 1. Set them for Com 4, the highest possible Communications IRQ on a PC.
3. Com 4 will now become the highest, most powerful IRQ in the circle. Com 3 will shadow, since there probably is no Com 3 on your motherboard. Com 1 and 2 will stay the same. Onboard jumpers must be set for the IRQ. The IRQ for a modem is typically 7, 9, 13, or 15. Other PCs have other IRQs. Some PCs only support IRQ 15. We will override this rule by setting the IRQ at 10. Now add 2 to 10, you get 12. Set the next device in line, which is probably your soundcard, at IRQ 12, in the Windows System Device viewer. After you have done this, you've got some software work to do.
4. In Windows 95, delete your modem drivers. I deleted the Intel 14.4 driver. In DOS, rename the driver from, for example, INTM144.DRV to INTM144.DR_. Now, install a newer driver, meant for the faster modem. It will automatically detect the modem, as if it is the actual thing. That's because an easter egg is placed in most modems made today. They always use Com 4 (though not WinModems, they take use Com 1 and Com 3).
5. Restart and use the Internet. You will find a difference in the performance.

This month:

- The difference between MPEG and M-JPEG
- Who watches the monitor makers?
- Enabling disabled games
- The ultimate 3D manifesto
- And readers' letters about Andrew

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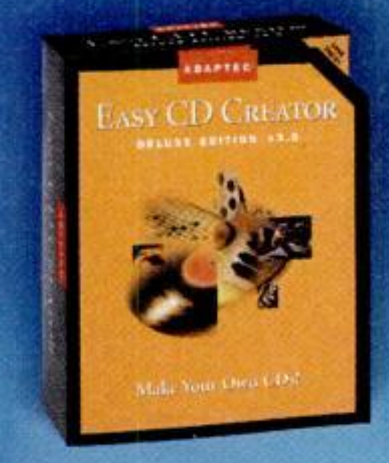

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By the way, this only works on these types of internal modems: Intel 14.4, Waytek 28.8, IBM, BQ-Elect, Intraspec, and Cardinal modems. It may work on proprietary modems made by Rockwell, for companies like Packard Bell, Compaq, Dell, Gateway, etc.

Try it. You might get lucky... I sure did!

—Martin Barron

Lend Me Your Ears

This is the first time I have ever written to a magazine. Always felt my voice was so tiny compared to the big piles of letters and e-mails you get, that I'd probably get drowned out, but I had to write about this since it hit so close to home.

Many thanks to T. Liam McDonald for bringing up this important issue of game accessibility for the deaf.

I have been deaf all my life and a certified computer geek. When I am not working on web sites, I'm firing up the latest games, and more often lately, I've been disappointed.

Case in point: *Thief: The Dark Project*. Wonderful game! Reawakens the old days when I used to always play a thief character in Advanced Dungeons and Dragons. Last night I fired up the demo. Wow. I'd buy it immediately, if not for the fact that there are no accessibility settings in the game.

Why is it so hard for game developers to come up with some really simple solutions? For example, it would be great if *Thief* had a little "radar" on the game screen that indicates where a sound is coming from. Running head-first into a guard in the dark gets old. I know I couldn't be an efficient cat burglar in real life (not that I would want to), but at the very least, I'd love to pretend to be one in a game.

And the recent batch of first-person action games are a real disappointment. As far as I know, there are no subtitles in *Half-Life*, *Rainbow Six*, and *Thief*. So how am I supposed to do well in the games when I miss mission-crucial information? It's no fun walking around feeling like an idiot.

I have a nifty sound set up, even though I'm deaf. My soundcard is hooked up to my seat cushion (**www.smarthome.com/8247.html**). A powerful bass transducer provides a lovely range of ass-shakin' vibration that puts me on almost equal footing with hearing players. At the very least, I know when someone is shooting at me in a deathmatch. Maybe not where they are, but it does compel me to start my panicky scramble for cover until I can figure where it came from.

In my opinion, computers are a gift to humankind. It doesn't care about your color, creed, disability, or what-have-you. Now, I feel like my computer has suddenly betrayed me, by demanding that I be able to hear.

This sucks.

—Tim Smith

The most prime recent example of "Throwing a Deaf Ear to the Disabled" is *Thief*. Reviews have stated that *Thief* is one of the first games that could *not* be won without speakers. And it's true... every one of my evenings over the past two weeks has been spent peering at a dark screen, listening for footsteps and zombie grumblings.

But my thought is that the "disabled" have that title because they can't experience life in the same way most of us do, and therefore are limited in which activities they can perform. These games are striving to produce as realistic an experience as possible using only two of our five senses. Given that, why should a deaf person expect to be able to perform actions in a false world without the same tools they would need in the real one?

"The problem is, many OEMs don't like to reveal who makes the original CRTs."

You need these fundamental connections with the outside world to have the experience! A text message of "You hear someone walking on a wooden surface above you" takes away a lot of the guesswork of the player.

—Josh Criz

The 3D Manifesto

We've lived too long under the yoke of haphazard and inconsistent 3D acceleration. We've been promised change by the greatest PR departments in the industry. OpenGL, a powerful and mature API, lies fallow in the C: drive due to poor support and the infamous Installable Client Driver. Direct3D, like many Microsoft products, has great ambition, but lacks the experience of other, more refined solutions. And then there's the much-vaunted Glide, whose power and reliability surprised every class of computer nerd. Which of these three giants is the future?

The future of 3D is best bestowed upon Direct3D. Before you cry treason, hear me out. Brothers, I say that the true traitor in our midst is Glide. It is the wolf in trilinear filtered, alpha-blended sheep's clothing! Imagine, if you will, Intel releasing an API that would only work with the i740. Every one of you would cry havoc and brood over the monopoly Intel was striving for. Why should it be different for 3Dfx? 3Dfx has chained you to its hardware and its own API under the guise of fighting the establishment. It only wishes to become the establishment. 3Dfx's recent purchase of STB just proves that. Imagine another Microsoft controlling the tender heart of your gaming rig, the videocard.

My comrades, we cannot let the growth and change that competition brings leave the 3D market, as well! As if this were not enough, the traitor has grown lax and failed in its duty to lead the way to 3D utopia. 3Dfx's next-gen card, the Voodoo^3, is surprisingly underwhelming. It is nothing more than an overclocked Voodoo^2. Rendition has tried the same tactic and look where it got them! Pilgrims like nVidia are truly leading us toward the future with higher resolutions and more features. It doesn't matter if you can play *Quake II* at 120fps if it's only at 800x600. The future, my friends, is in resolution and picture quality. We *already* have the speed!

But there's yet one more contender, which John Carmack and his minions tout as the best solution: OpenGL. I do not debate the power and prowess of OpenGL, but rather its stability on Windows 95/98. OpenGL can be amazing or terrifying, and the outcome rests on the shoulders of the board manufacturer. I currently own three videocards, and only one has a reliable ICD. OpenGL was not meant for Windows—the formerly stable API thrashes pitifully on many of today's systems. This, combined with SGI's promise to ignore it in the face of Fahrenheit, leaves a dark cloud over the future of OpenGL on the PC.

Even so, Direct3D cannot simply be crowned king by default, it must show merit, and this it does.

Friends, users, gamers—lend me your ears: D3D will support whatever your hardware can give you, be this in an accelerator or a processor. It will be installed on the majority of PCs and will be integrated into the software of the most used OS in the world! It may not offer the same Herculean power as a proprietary API such as Glide, but think of the havoc that would be loosed on the developers if they had to contend with a different API for each piece of hardware.

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I'm not an expert or a highly paid analyst. I'm a gamer and an enthusiast, just like you. It's not wrong to embrace a piece of Microsoft. It is only wrong to deny that child because of the problems of its parent. Do not reject D3D and accept 3Dfx simply because of its past. Things change, and without change, there is only death. You must judge each new day and the tech it brings with fresh eyes, lest you lose sight of the future in the cloudy memories of the past.

—Bret Sadler

Meet Your Monitor Maker

My upgrading days on my current system are over, and it's time for a complete new system to upgrade over the next few years. I've been pleased with my monitor and wish to make another wise monitor decision on this system. Is there any way, in your reviews, to let readers know what monitors are based on or what model it really is? I realize you review the monitors with the system, but instead of saying "Cheesy monitor," could you follow that with "spend another 200 bones for the xyz monitor based on Sony's PS line"?

—Todd M. Smith

Executive Editor Jon Phillips replies: As the "monitor guy," I always try to identify a re-branded monitor's original CRT manufacturer whenever I do system reviews. But, you're right, this approach should be magazine policy. We'll talk about this internally; your suggestion is valid.

The problem is, many OEMs don't like to reveal who makes the original CRTs and simply say the CRTs are "multisourced." This allows OEMs to bounce around from one CRT manufacturer to another and get the cheapest price possible whenever reordering new monitors en masse.

Just because you're buying an OEM-branded, 19-inch Trinitron monitor *doesn't* mean it's a Sony 400PS under a different name. Sometimes CRT manufacturers such as Sony will build 1,000 monitors to a lower spec and then sell them to system OEMs at a reduced cost. These monitors might offer slightly slower refresh rates and lack a few control functions. But good core technology can't be "spec'd down," so I wouldn't shy away on a good deal offered by a system OEM.

Motion Lotion

What is the difference between Motion JPEG and MPEG? I am planning to buy the Matrox Marvel G200, which is Motion JPEG, to do some home video and wedding video editing. However, an article in the January issue stated that Motion JPEG is dead and MPEG-2 will be coming. In that case, should I push off my purchase and wait for MPEG-2 encoder cards? Will there be any major differences between the two?

—David Ng

Software Editor Rick Popko replies: M-JPEG and MPEG are two different video compression algorithms. M-JPEG compresses every frame as it's digitized to a hard drive, while MPEG only compresses the differences between frames. MPEG does a great job at compressing video while maintaining a decent picture quality (high-quality video is compressed between 2Mb and 10Mb per second); however, because it only digitizes changes from frame to frame, it's a difficult algorithm to edit. High-quality M-JPEG, on the other hand, requires that you capture between 5MB and 7MB per second, but because it digitizes every frame, it's very easy to edit.

The Matrox Marvel is a decent, inexpensive M-JPEG capture board if you're digitizing video at low data rates for CD-ROM or the Internet. It is not good at capturing data rates above 4MB/sec (or VHS quality).

$300 MPEG-2 encoders are coming, but they won't ship until Christmas this year. The great thing about the new MPEG-2 encoders is that they'll allow you to encode DVD-quality video and edit the stream.

"It is only wrong to deny that child because of the problems of its parent. Do not reject Direct3D and accept 3Dfx simply because of its past."

What's a Few Vertices Among Friends?

In response to Tom Halfhill's Fast Forward article in Maximum PC, I have a math-related question. Since I don't know much about 3D graphics, forgive me if I'm way off.

Mathematically speaking, 1,000 tesselated triangles would not have 3,000 vertices. Take a much more simplistic example of six triangles put together to make a hexagon:

You should have six triangles in there, but a total of only seven vertices (one at each corner of the hexagon, and one at the center).

Let me know if this is errant thinking.

—Paul Adams

Columnist Tom Halfhill replies: Your example of a hexagon is correct. My calculation of the number of vertices in a 3D object made of triangles was based on a worst-case scenario. I agree it would be unlikely for every vertex not to have another polygon attached to it—an extreme case might be an "explosion" in which a 3D object is blown to pieces and each fragment is an unattached polygon. Your example of a hexagon would have six triangles and seven vertices, but a hexagon is a regular geometric shape, and not very typical of the irregular 3D objects in games. I don't know the average number of polygons attached to a vertex. It's undoubtedly closer to your example than to mine, so forgive the error of my oversimplification.

However, if I had stated a more average number of vertices per polygon in my example, somebody would have multiplied the number of triangles (1,000) times the number of vertices (three per triangle) and written me a letter asking why my answer didn't add up to 3,000. Then I'd have to explain it by writing a long paragraph like this one.

Cut, Copy, Paste

In the January 1999 issue, the RealMagic Hollywood+ review on page 97 states that the two revisions of the board can be differentiated by the color of the Dolby Digital (AC3) S/PDIF connector. This is correct except that the older revision of the board (A2) has the yellow S/PDIF while the newer revision (A3) has the orange S/PDIF. We apologize for any confusion this may have caused.

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Readers' Eulogy

I have a lump in my throat. I didn't know Andrew personally, but in the boot days, he responded to several of my e-mails. I have some kind of connection with the people that put out your mag, and I feel like a family member is gone. His articles always had an edge that gave you the feeling that the writer put a little of himself into the piece.

Give those PCs hell up there, Andrew!

—Jason Lewis

I have felt that over the years (has it been that long?) every member of your magazine has become a part of my family. I am at a total loss for words to even begin to describe how I feel now. Your loss is also my loss. I will never be able to ask Andrew for advice. Equally chilling is the fact that this industry has lost one of its best, if not the best. There has been no other hardware reviewer that has garnered as much recognition as this man. It is because he was pure and unadulterated. No middle ground. This man knew no equal in a field that is filled with cream-puff, jerk-off journalism. We shall forever miss this icon of a man. Watch out Heaven... A great one is coming... Receive him well... He deserves it.

—Scott Tarr

I wanted to take a moment to express my deep sadness in hearing Andrew passed away. As the desktop review manager at Micron Electronics, I had the opportunity to work with Andrew on several occasions. That first day I met Andrew, he was very enthusiastic. Andrew maintained the "tell it like it is" style that we always respected and appreciated. Andrew was a great editor and will be missed by all of us who had the pleasure of working with him. He was a great guy.

—Tyler Andrew, Micron

Without a doubt, my world is a darker place without Andrew. I speak for the entire Engineering staff at Hi-Val when I say his passing is deeply felt, and he will be missed.

—James Lee

The wonderful people at *Maximum PC* aren't going to be the only ones to miss him... He was a really intelligent guy that always looked upon the less knowledgeable as equals.

—Drew Lanclos

I just want to pass along my deepest sympathy to you all for the untimely departure of Andrew Sanchez. I've been reading your mag for a long time and get a sense that your staff is like a family. Although I may not have met any of you, I do look forward to seeing and hearing from you all once a month. The picture that will stay in my mind is Andrew sitting in the bootLab, hair pulled back, cherry coke at his side, and the shoe pulled from S3's ass!

—Solley

"I have some kind of connection with the people that put out your mag, and I feel like a family member is gone."

I would like to express my sincere remorse about your loss of Andrew Sanchez. I did not know Mr. Sanchez, but I will tell you that he was a very kind man who helped out many people. He had helped me out with a few problems with my system, and my many thanks go to him, wherever he may be. It is always hard when we lose someone close to us, and this is no exception. To leave at such a young age makes it even more tragic, and I found myself thinking of my own mortality. I'm only 17, and my dream is to work in the computer industry. I'm sure Mr. Sanchez had the same dream. A dream that was realized.

—Andrew Hansen

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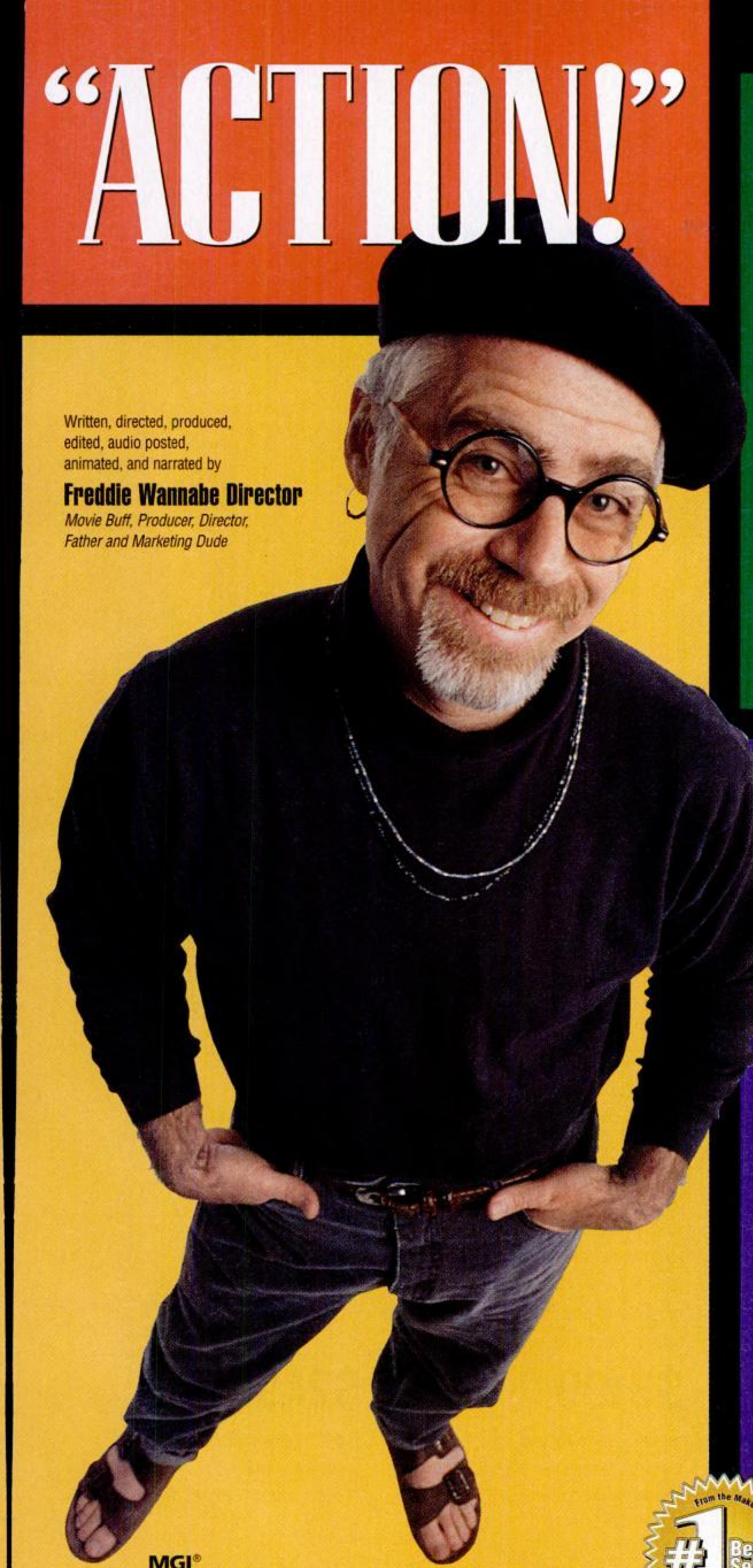
"ACTION!"



Written, directed, produced,
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animated, and narrated by

Freddie Wannabe Director
Movie Buff, Producer, Director,
Father and Marketing Dude

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MGI VideoWave II's unique "Storyline" approach, familiar VCR-style buttons, real-time playback viewing screen and powerful editing features make it simple to produce imaginative and very professional results without special training.

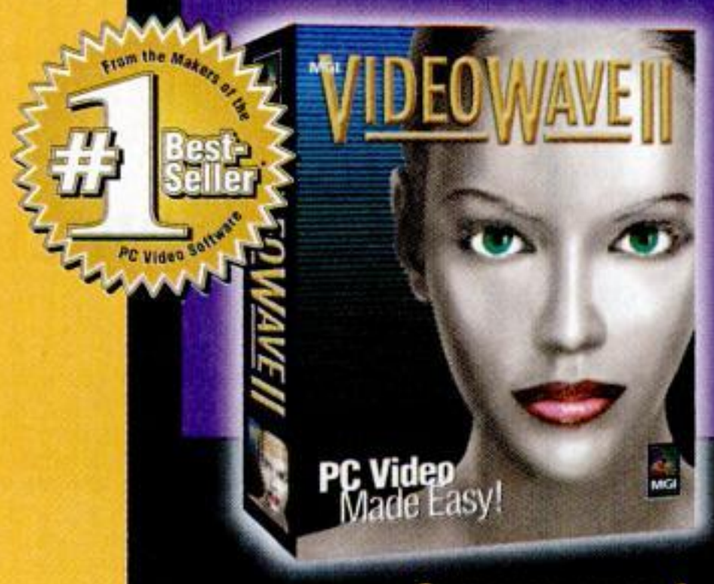
MGI's other products are just as effective and fun to work with. I've used MGI PhotoSuite II to edit stills for my videos and to create electronic albums of scene shots so my brother can view my storyboards on the Internet. I also produced an album of our family photos on my computer. The special effects added flair to my shots and red-eye is a thing of the past.

MGI PhotoSuite II only $49.99**

With MGI's software I can add and edit special effects and make my own greeting cards and calendars – even share photos in the Internet! I also created posters to promote my MGI VideoWave II production ideas to the suits.

Just one phone call got the ball rolling. Find out how MGI Software can help you. Call **1-888-MGI-SOFT** or visit their web site at **www.mgisoft.com**.

Gotta go. See you in the movies!



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**SUS, Suggested Retail Price. Dealers may sell for less. *Video capture device, TV tuner card or DV Camera required.
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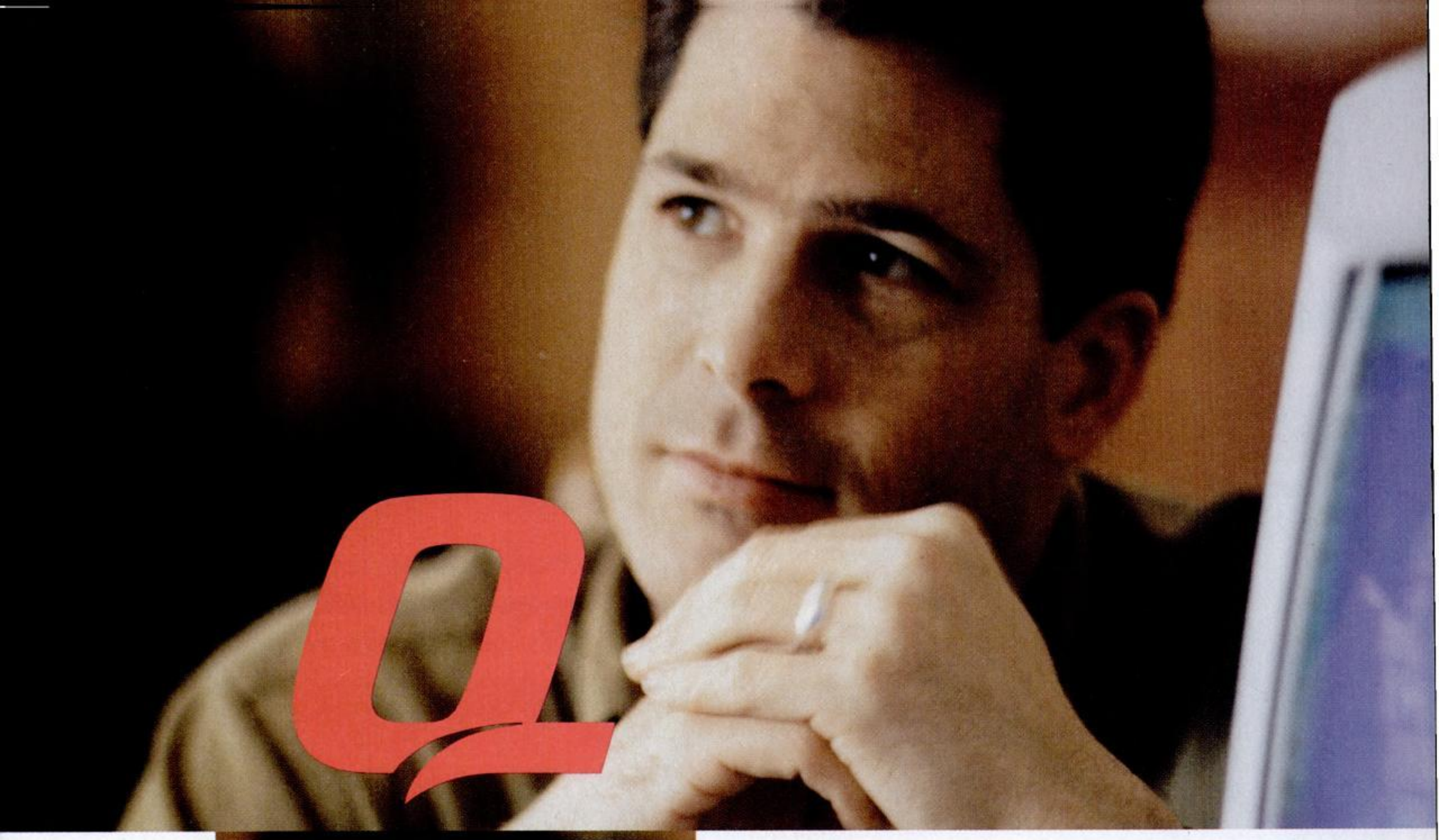

You want to e-mail.
He needs to download.
She'd like to surf.
Who will be left standing?

Compaq Awards

September 1998 **PC WORLD/FAMILY CIRCLE**
One of the 10 best PCs for home- or school-power systems • **PRESARIO 5630**

July/August 1998 **FAMILY PC**
Family PC Recommended Award • **PRESARIO 5600**

August/September 1998 **WINDOWS MAGAZINE**
WIN LIST • **PRESARIO 5600 SERIES**

June 1998 **BOOT MAGAZINE**
Kick-Ass Product • **PRESARIO 5600 SERIES**

	PRESARIO 5600i-500/3 INTERNET PC	**PRESARIO 5600i-500/3 INTERNET PC**
	Intel® Pentium® III Processor, 500 MHz	Intel Pentium III Processor, 500 MHz
	128 MB SyncDRAM expandable to 384 MB	128 MB SyncDRAM expandable to 384 MB
	16.8 GB UltraDMA Hard Drive[1]	13.0 GB UltraDMA Hard Drive[1]
	6X DVD-ROM Drive[5]	6X DVD-ROM Drive[5]
	Diamond Viper 550 AGP w/16 MB SDRAM	Diamond Viper 550 AGP w/16 MB SDRAM
	Diamond Monster Sound MX300 PCI Audio Card	Aureal 8820 PCI Audio Card
	6.0Mb Max Digital Modem[6]	6.0Mb Max Digital Modem[6]
	JBL Pro Premium Speakers w/Subwoofer	JBL Pro Premium Speakers w/Subwoofer
	Digital Creativity Imaging Center[3]	10 Mbps Ethernet Port, Cable Modem Ready[8]
	10 Mbps Ethernet Port, Cable Modem Ready[8]	MS Featured Home Collection & MS Word
	Home Phoneline Networking[7] (Integrated)	Microsoft Windows 98
	Microsoft® Featured Home Collection & MS® Word	Compaq V910 19" Monitor (18.0" VIA)
	Microsoft Windows®98	
	Compaq FP700 15" Flat Panel Monitor	
	$3199	**$2499**
Personalize with these options:	256 MB SyncDRAM: Add $300	19.2 GB UltraDMA Hard Drive:[1] Add $115
	Iomega® Zip Built-In™ Drive with 1 disk: Add $79	Home Phoneline Networking[7] for 2 computers:** Add $99
	22.0 GB UltraDMA High Performance Hard Drive:[1] Add $225	Tripp Lite Internet Office 700 UPS : Add $189.95

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intel inside
pentium® III

Peace, harmony, and multiple Internet access. Signs of a happy household.

"It's my turn to go online." "No, it's my turn." "Is not!" "Is too!" Was this what the Internet promised? The people at Compaq don't think so. That's why we created these new Compaq Presario 5600 Internet PCs. They're the first computers with Home Phoneline Networking,[7] which lets you plug your family's PCs into your home's phone jacks. This allows everybody to surf the Net at the same time, on the same phone line.† So while dad e-mails his college roommate, the kids can visit their school's Web site. You can also share printers, files, and games. And there's more, like one-touch Internet access and 50 free hours on the Net.* Plus, these PCs are available with a 6.0Mb Max Digital Modem,[6] which works with your 56K dial-up access sources for incredibly fast access right away. As an added bonus, it lets you talk on the phone while you surf. And since it's ADSL and cable modem ready,[8] you can tap into those new high-speed technologies as soon as they come to your area. Of course, these PCs are loaded with tons of other great features, like Intel® Pentium® III processors, thrilling 3D graphics, DVD- or CD-ROM drives, and more — all at an incredible value. So now, your family can e-mail, download, and surf in a whole new way: peacefully.

PRESARIO 5600i-500/3 INTERNET PC	**PRESARIO 5600i-450/3 INTERNET PC**	**PRESARIO 5600i-450/3 INTERNET PC**	**PRESARIO 5600i-400 INTERNET PC**
Intel Pentium III Processor, 500 MHz	Intel Pentium III Processor, 450 MHz	Intel Pentium III Processor, 450 MHz	Intel Pentium II Processor, 400 MHz
128 MB SyncDRAM expandable to 384 MB	128 MB SyncDRAM expandable to 384 MB	96 MB SyncDRAM expandable to 384 MB	64 MB SyncDRAM expandable to 384 MB
13.0 GB UltraDMA Hard Drive[1]	13.0 GB UltraDMA Hard Drive[1]	13.0 GB UltraDMA Hard Drive[1]	10.0 GB UltraDMA Hard Drive[1]
6X DVD-ROM Drive[5]	32X Max CD-ROM Drive[4]	32X Max CD-ROM Drive[4]	6X DVD-ROM Drive[5]
Diamond Viper 550 AGP w/16 MB SDRAM	2X AGP Graphics w/8 MB SGRAM	2X AGP Graphics w/8 MB SGRAM	2X AGP Graphics w/8 MB SGRAM
Aureal 8820 PCI Audio Card	Aureal 8820 PCI Audio Card	Aureal 8820 PCI Audio Card	Aureal 8820 PCI Audio Card
56K ITU V.90 Modem[2]	56K ITU V.90 Modem[2]	56K ITU V.90 Modem[2]	56K ITU V.90 Modem[2]
JBL Pro Speakers	JBL Pro Speakers	JBL Pro Speakers	JBL Pro Speakers
10 Mbps Ethernet Port, Cable Modem Ready[8]	10 Mbps Ethernet Port, Cable Modem Ready[8]	10 Mbps Ethernet Port, Cable Modem Ready[8]	10 Mbps Ethernet Port, Cable Modem Ready[8]
MS Featured Home Collection & MS Word	Microsoft Office 97 Small Business Edition	MS Featured Home Collection & MS Word	MS Featured Home Collection & MS Word
Microsoft Windows 98	Microsoft Windows 98	Microsoft Windows 98	Microsoft Windows 98
Compaq V720 17" Monitor (15.9" VIA)	Digital Creativity Imaging Center[3]	Digital Creativity Imaging Center[3]	Compaq V720 17" Monitor (15.9" VIA)
	Compaq V720 17" Monitor (15.9" VIA)	Compaq V720 17" Monitor (15.9" VIA)	
$2199	**$1999**	**$1899**	**$1599**
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6.0Mb Max Digital Modem:[6] Add $99	6.0Mb Max Digital Modem:[6] Add $99	6X DVD-ROM Drive:[5] Add $59	Iomega Zip Built-In™ Drive with 1 disk: Add $79
Compaq V910 19" Monitor (18.0" VIA): Add $170	Iomega® Zip Built-In™ Drive with 1 disk: Add $79	Diamond Monster Sound MX300 PCI Audio Card & JBL Pro Premium Speakers w/Subwoofer: Add $89	Home Phoneline Networking:[7] Add $49

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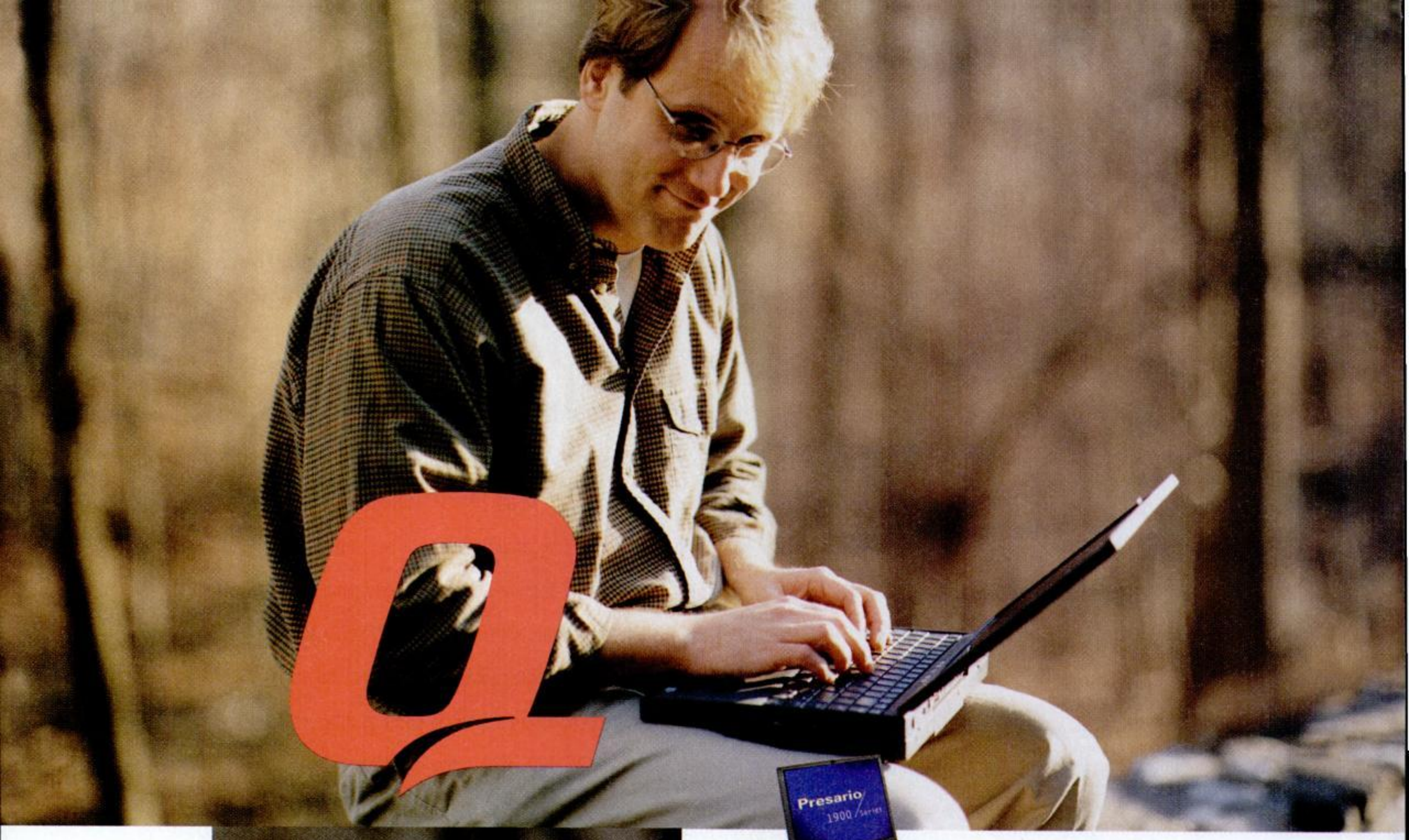

Moves fast,
is incredibly thin,
and has a
fantastic memory.
Remember when
you were like that?

Compaq Awards

October 1998 **EQUIP MAGAZINE**
5 Star Rating and Best Overall Notebook Award • **PRESARIO 1650**

July/August 1998 **FAMILY PC**
Best Multimedia Notebook of the Year • **PRESARIO 1680**

April 1998 **LAPTOP BUYERS GUIDE & HANDBOOK**
BEST BUY Award • **PRESARIO 1621**

	PRESARIO 1900-366 INTERNET NOTEBOOK PC	**PRESARIO 1900-333 INTERNET NOTEBOOK PC**
	Intel® Pentium® II Processor, 366 MHz	Intel Pentium II Processor, 333 MHz
	13.3" TFT Active Matrix XGA Display	13.3" TFT Active Matrix XGA Display
	128 MB SyncDRAM expandable to 192 MB	96 MB SyncDRAM expandable to 192 MB
	10.0 GB UltraDMA Hard Drive[1]	6.4 GB UltraDMA Hard Drive[1]
	2nd-Generation DVD-ROM Drive[4]	2nd-Generation DVD-ROM Drive[4]
	256-bit AGP Accelerated 3D Graphics w/2.5 MB VRAM	256-bit AGP Accelerated 3D Graphics w/2.5 MB VRAM
	56K ITU V.90 Modem[2]	56K ITU V.90 Modem[2]
	Smart Lilon Battery	Smart Lilon Battery
	256 KB Integrated "On-chip" cache	256 KB Integrated "On-chip" cache
	Microsoft® Office 97 Small Business Edition	MS® Featured Home Collection & Windows 98
	Microsoft Windows® 98	Folio Carrying Case
	$3699	**$2999**
Personalize with these options:	192 MB SyncDRAM: Add $150	10.0 GB UltraDMA Hard Drive:[1] Add $350
	Extra Smart Lilon Battery: Add $129	Extra Smart Lilon Battery: Add $129
	Port Replicator: Add $129	Tripp Lite Super Notebook Protector: Add $14.95

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Have it all without carrying it all.

We created a precision-engineered wedge that contains a DVD-ROM, floppy drive, and port replicator connector. With the wedge on, you've got the ultimate, all-in-one multimedia notebook. Snap off the wedge and you've got a lean, mean, 1.2-inch-thick notebook that weighs in at only 5 lbs. (Which is a good thing when you're sprinting for a plane.) Either way, you'll have a notebook with one-touch Internet access, outrageous graphics, a high-speed modem, and a large, vibrant screen. It's everything you could wish for.

PRESARIO 1900-300 INTERNET NOTEBOOK PC	**PRESARIO 1600i-366 INTERNET NOTEBOOK PC**	**PRESARIO 1600i-333 INTERNET NOTEBOOK PC**	**PRESARIO 1600i-300 INTERNET NOTEBOOK PC**
Intel Pentium II Processor, 300 MHz	Intel Pentium II Processor, 366 MHz	Intel Pentium II Processor, 333 MHz	Intel Pentium II Processor, 300 MHz
13.3" TFT Active Matrix XGA Display	14.1" TFT Active Matrix XGA Display	14.1" TFT Active Matrix XGA Display	14.1" TFT Active Matrix XGA Display
64 MB SyncDRAM expandable to 192 MB	96 MB SyncDRAM expandable to 192 MB	64 MB SyncDRAM expandable to 192 MB	64 MB SyncDRAM expandable to 128 MB
6.4 GB UltraDMA Hard Drive[1]	6.4 GB UltraDMA Hard Drive[1]	6.4 GB UltraDMA Hard Drive[1]	4.3 GB UltraDMA Hard Drive[1]
2nd-Generation DVD-ROM Drive[4]	24X Max CD-ROM Drive[3]	2nd-Generation DVD-ROM Drive[4]	2nd-Generation DVD-ROM Drive[4]
256-bit AGP Accelerated 3D Graphics w/2.5 MB VRAM	256-bit Accelerated 3D Graphics w/2.5 MB VRAM	256-bit Accelerated 3D Graphics w/2.5 MB VRAM	256-bit Accelerated 3D Graphics w/2.5 MB VRAM
56K ITU V.90 Modem[2]	56K ITU V.90 Modem[2]	56K ITU V.90 Modem[2]	56K ITU V.90 Modem[2]
Smart Lilon Battery	Smart Lilon Battery	Smart Lilon Battery	Smart Lilon Battery
256 KB Integrated "On-chip" cache	256 KB Integrated "On-chip" cache	256 KB Integrated "On-chip" cache	256 KB Integrated "On-chip" cache
Microsoft Featured Home Collection	Microsoft Office 97 Small Business Edition	Microsoft Office 97 Small Business Edition	MS Featured Home Collection & Windows 98
Microsoft Windows 98	Microsoft Windows 98	Microsoft Windows 98	Folio Carrying Case
$2749	**$2999**	**$2849**	**$2499**
Port Replicator: Add $129	192 MB SyncDRAM: Add $250	128 MB SyncDRAM: Add $200	6.4 GB UltraDMA Hard Drive:[1] Add $100
Extra Smart Lilon Battery: Add $129	2nd-Generation DVD-ROM Drive:[4] Add $149	Tripp Lite 140 Watt Inverter: Add $49.95	Extra Smart Lilon Battery: Add $129
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Warning: You May be Under Surveillance

Intel ships Pentium III with processor serial number active; privacy advocates call for boycott

It seemed like a good idea at the time. That's what Intel engineers were saying when their plans to tag and bag Pentium III processors with a unique serial number were met with a storm of protest just prior to the chip's official launch in late February.

At the heart of the dispute is a hard-coded, 64-bit processor serial number—or PSN—which will be incorporated into every Pentium III. Intel says the serial number was designed to act as another layer of security for e-commerce transactions or asset management by IT departments, but privacy groups say it sets a scary precedent by allowing user data to be unwittingly transmitted over the net.

Intel disagrees, but says to pacify concerns, it's making available a software utility that will allow users to control whether the serial number feature is turned off or on. By default, all Pentium IIIs will ship with the setting turned on, but once a user turns it off, the Windows registry is automatically updated and retains the setting for future use. However, if the software utility is used to turn the feature back on, it won't take effect until the PC is rebooted, so chances that a web site could do this—without the user knowing—are slim.

Still, the fact this utility wasn't ready in time to ship with the first manufactured Pentium III systems—and is currently only available for Windows—has groups like the Electronic Privacy Information Center (EPIC) riled. "Intel's 'solution' puts the burden on the end user, and their privacy remains at risk if they use a PC with a Pentium III inside," said Marc Rotenberg, executive director of EPIC. He says Intel should recall all of its chips and remove the feature altogether, and is asking consumers to boycott system vendors selling Pentium III-based PCs.

Still, Intel doesn't seem worried that will happen. "No web site will be able to grab the number surreptitiously without the user knowing or consenting to it," said Intel spokesperson George Alfs. "In order to read the number, a web site will have to push an executable program onto the user's machine. As long as your browser security level is set to medium or above, a security box will pop up asking you to approve the action." Alfs says

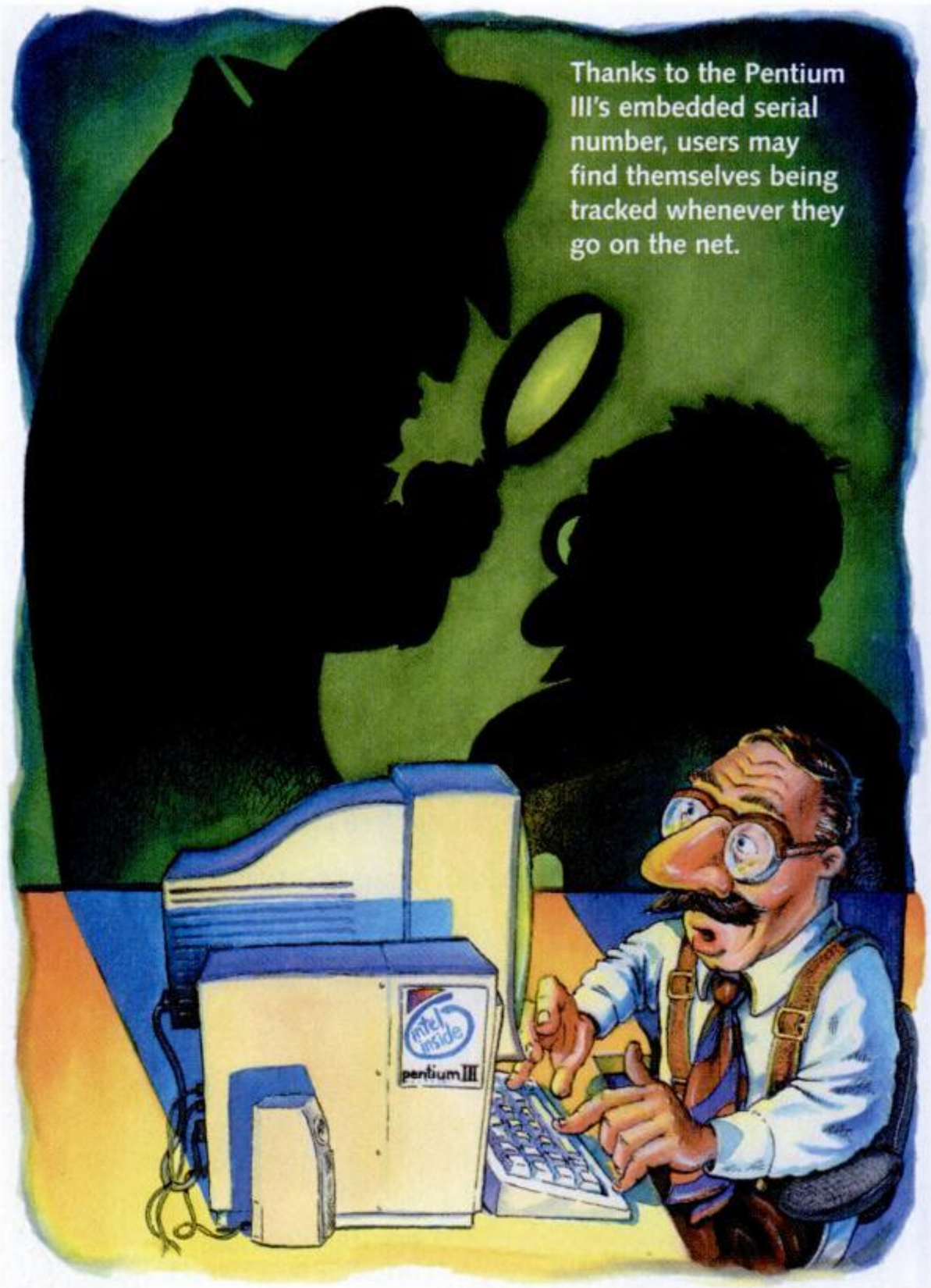
Thanks to the Pentium III's embedded serial number, users may find themselves being tracked whenever they go on the net.
intel inside
pentium III

ILLUSTRATION BY SCOTT PECK

SPIN CYCLE

This month's top stories broken down ►

HEADLINE	NEWS	DETAILS	QUOTE	OUR TAKE
Hard Drive Record Set	Seagate has found a way to pack more than 16 billion bits of data per square inch on a single hard disk platter, breaking the record for the "highest disk drive areal density."	Seagate used merged read-write Giant Magneto-Resistive Head technology and magnetic thin-film, low-noise, ultra-smooth cobalt alloy media.	"We plan to release GMR drives—but with a lower areal density—later this year," said company vice president Tom Porter.	Big whoop. Why do companies make a big deal about technology that's still three years off? Call us when you have the drives ready.
Kenwood Unveils World's Fastest CD-ROM Drive	Kenwood has introduced a 52x CD-ROM drive based on Zen's TrueX technology, which uses multibeam technology to read six data tracks in unison.	Since Kenwood's drive is CLV in nature, you'll get data reads of 52x across the whole disc, guaranteeing data throughput in the range of 6.7MB/sec to 7.8MB/sec.	"Kenwood has taken CD-ROM drive performance to levels that many in the industry thought were not possible," said Zen President Emil Jachmann.	Sounds cool, but we'd be much more excited about a DVD-ROM drive that incorporates Zen's TrueX technology.

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Alternate OS Users Ask for Windows Refund

Vendors reluctant to pony up

Windows expatriates hope to get money back for the OS they didn't want in the first place.

You might be entitled to a $100 Windows refund from your PC manufacturer.

A growing number of alternate OS users believe Windows 98's End User Licensing Agreement (EULA) promises refunds if you don't actually use Microsoft's dominant OS.

The agreement contains language that says if the user doesn't agree to the terms they should "promptly contact Manufacturer for instructions on return of the unused product(s) for a refund."

It's this one line that's prompted an untold number of Linux, Be, BSD, and other alternative OS users to begin asking for a refund on the unused Windows product.

"OEMs have a lot of competitive pressures on them, and we don't want to make them change the way they do business," said Don Marti, a San Francisco–based computer consultant. "We just want to make it convenient for people to obtain the refund." Marti is one of the organizers behind Windows Refund Day (held on February 15), where alternative OS users were encouraged to show up at a local Microsoft office with unused copies of Windows and demand a refund.

The refund movement has been simmering for the last few years, but wide publicity of an Australian who goaded Toshiba into giving him $109 for his unused copy of Windows 95 helped bring the case to a boil. Alternate OS users have long griped that machines from large companies can't be purchased without Windows, but it wasn't until recently the groups began using the agreement itself as ammunition.

Rob Enderle, an analyst with Giga Information Group, said it just isn't practical for OEMs to build consumer machines with a different OS (such as Linux) or ship them bare, because they have to certify them and offer warranties with an OS.

Alternate OS users would

Windows Refund | 26 ▶

that if the number is turned off, but the user allows the executable to run, it still won't be able to retrieve any information. "If a web site runs software on your machine, the least of your worries will be the processor serial number," he warns. "It could be formatting your hard drive, or grabbing banking and social security numbers."

EPIC is concerned web sites will soon start stockpiling processor serial numbers—or sell them for tracking purposes—but Intel says it is recommending the numbers be hashed before being stored in a database. It's also unlikely that web sites will restrict access to only those users with a Pentium III, since doing so would be detrimental to the site's hit rate. Although the Pentium III is the first Intel chip to include the feature, others—including Pentium III Xeon and Pentium III mobile chips—will follow. Pentium II and Celeron will come later, and since Intel plans on making the technology public, other processor companies may also follow suit. So far, however, there are no takers.

"We are concerned about the potential of compromising the privacy of the individual."
—AMD's Sandra Wheatley

"AMD certainly understands the motivation for improving security for web-based transactions and e-commerce," said AMD spokesperson Sandra Wheatley. "However, we are concerned about the potential of compromising the privacy of the individual and are evaluating the alternatives for addressing this issue." ✹

to the pertinent details.

24 ▶

HEADLINE	NEWS	DETAILS	QUOTE	OUR TAKE
Creative Says "Yes" To MP3s	Creative Labs has finally confirmed that it plans to embrace the MP3 movement and introduce a portable player sometime this year.	There aren't many. Creative officials had been keeping the device under wraps, but after a UK manager popped the cork, Creative publicly confirmed its plans.	"It is going to be MP3," said Creative spokesperson Rick Myllenbeck, who would not disclose a price, features, or even a ship date beyond "this year."	After showing a concept MP3 player at last fall's Comdex, why did Creative continue to lay low? It must be afraid of an RIAA lawsuit.
Court Sets Free Speech Precedent for the Web	A jury found that a web site incited violence against abortion doctors and fined its activist founders $100M.	The doctors receiving the damages were listed as "wanted" on the group's site. The site's ISP has since pulled the plug.	"This is terrorism," said the plaintiffs' attorney in closing arguments, referring to four doctors and two clinic workers killed since 1993.	Site providers can't hide behind the First Amendment to justify posting content that some may deem offensive or controversial.

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technology ▶ 3D

The Bitboys Speak

Reveal details about their upcoming Glaze3D graphics chip

Forget about Voodoo^3, TNT2, and Savage 4. What everybody wants is the 411 on Bitboys Oy's forthcoming 2D/3D accelerator, Glaze3D. Its ethereal specification list includes almost every item on a power user's silicon wish list, but when we wrote our Pure Power Preview (back in the January 1999 issue), Glaze3D existed only as a simulation, not silicon.

We spoke to Bitboys Oy's **Mike Tuomi** about Glaze3D and forced him to spew a few facts:

Maximum PC Does Glaze3D support texture compression?

Tuomi Yes, the Glaze3D architecture supports texture compression, but we have not decided which formats—such as S3's—to include.

Maximum PC Will Glaze3D support anisotropic filtering?

Tuomi Yes

Maximum PC Are there any DirectX 6 features that Glaze3D does not support?

Tuomi According to Microsoft, "No hardware ever will support all DirectX features." The feature palette of DX6 is huge, but Glaze3D will support more DX6 features than other accelerators.

Maximum PC Can you explain in detail how Glaze3D's core processor—which handles quad-texturing—works?

Tuomi The magic is in the texture cache unit that gives four filtered texels per cycle.

Maximum PC How will the Scan Line Interleave mode work? Since AGP is a single slot solution, will there be a dual-chip/single-card setup?

Tuomi We have solved this issue with an external AGP bridge chip.

Maximum PC What level of AGP will it support?

Tuomi 2x and 4x. And depending on the video DAC we choose, it'll handle resolutions up to 1600x1200, possibly more.

Maximum PC How closely are you working with game developers to get them to start using more than dual textures? Who's signed up to use Glaze3D?

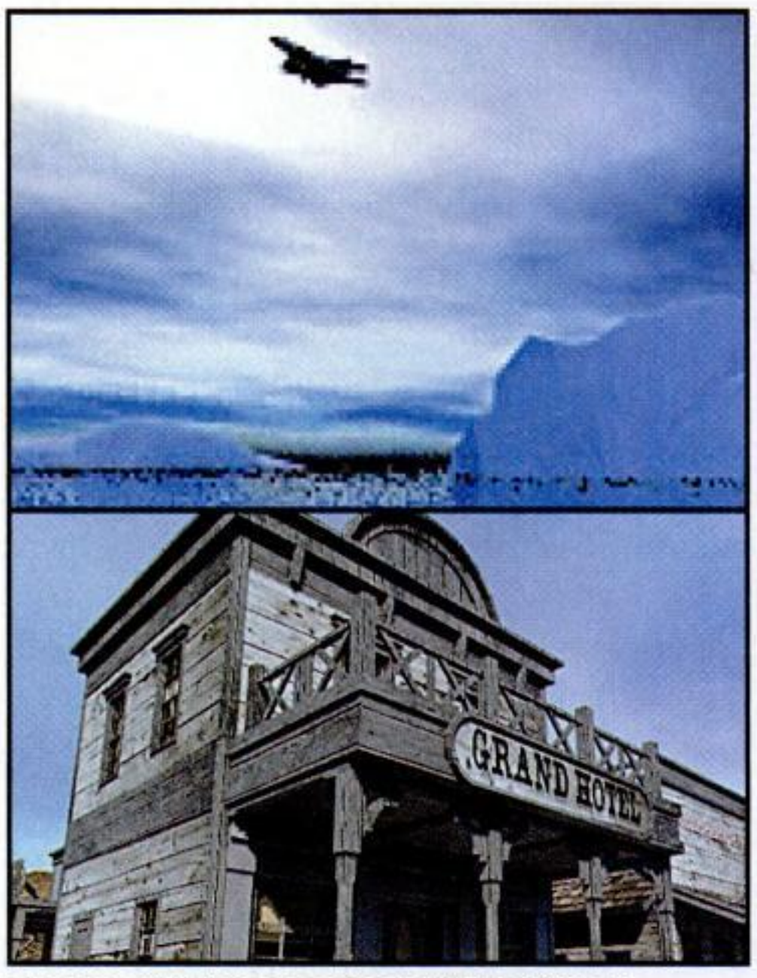
Tuomi We're working closely with Remedy Entertainment, which is currently working on *Max Payne*. We're not yet at a point to sign up developers, since we don't have reference boards available.

Maximum PC Will there be a proprietary API for Glaze3D?

Tuomi Undecided, but if there is, it'll be very low level.

Maximum PC Is there alpha silicon available yet? When will mass production ramp up?

Tuomi Glaze3D is currently in synthesizable VHDL. Silicon implementation is starting very soon, and we should see first silicon late this summer. ✹



These still images were taken from Glaze3D realtime product demos.

◀ Windows Refund | 25

benefit more from banding together and convincing a single large OEM to ship with Linux, he said. If enough business is drummed up and OEMs see the dollars, they may jump aboard as well.

"Demanding refunds for Windows does nothing but piss off Microsoft and make a political statement," Enderle said. "Besides, some EULAs also treat the hardware and software as a single package that must be returned."

That's the official response Dell is taking. Customers who have asked for refunds are being told they must return the entire computer for a complete refund. But the company isn't closed to offering alternative OSes. Dell sells servers configured with other OSes and can make custom changes in large-quantity orders.

"When demand for a peripheral or app or OS advances beyond a point where we can make it cost effective for customers, we'd be foolish not to offer it," said T.R. Reid, a spokesperson for Dell.

Never one to fan the fire, Microsoft is leaving it up to OEMs to determine how they want to handle the situation. "Those customers interested in receiving a refund should contact their OEM," a spokesperson said. ✹

SPIN CYCLE

◀ 25

HEADLINE	NEWS	DETAILS	QUOTE	OUR TAKE
More Hunting Sims On The Way	GT Interactive is joining forces with professional hunting organization Buckmasters to produce hunting sims for the PC. At least two new games will appear later this year.	The company will also become an official sponsor of Buckmasters, joining an elite group of sponsors that includes, Remington Fire Arms.	"Teaming with Buckmasters will help GT Interactive continue to be a leader and set new standards in interactive hunting games," said GT CEO Ron Chaimowitz.	Talk about setting your standards low. Couldn't the company take some of that profit to develop games that are truly innovative and unique?
Compaq Turns AltaVista Into Separate Entity	Compaq is spinning out AltaVista into a separate web company that will be headed up by Rod Schrock, Compaq's senior vice president.	Compaq hopes to make AltaVista Company the leading destination site for information and e-commerce on the Internet.	"By establishing AltaVista as a separate company, we can better focus on providing the best user experience on the Internet," said Compaq CEO Eckhard Pfeiffer.	We still don't get portals. Savvy web browsers are smart enough to bookmark the important sites and usually rebuke all of that push crap.

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DEMONSTRATION #2:

1. Tear out your old sound card.
2. Smash into pieces.
3. Toss over your shoulder.

► The sound those pieces make when they hit the ground all *around* you is the power of A3D from Aureal, the only audio that works the way your ears do.

That's why leading sound card vendors, such as Diamond, TerraTec, Turtle Beach, and Xitel, are using Vortex audio technology from Aureal, the only 3D audio accelerator that supports industry leading A3D positional audio technology.

You can also find A3D positional audio on computer models from the industry's leading PC manufacturers.

Audio based on Aureal technology is awesome. But don't take our word for it. Believe Your Ears. Check out A3D at your local retailer.

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SO WHAT IF WE'RE THE SMALL FISH IN THE BIG POND.

Piranha, pi·rän'ya, *n.* A small, voracious freshwater fish that will attack any sized opponent, no matter how large.

We're not the biggest, so we have to be the best.

So, we're not the biggest – that means we try harder...we have to be the best. By offering the perfect **combination of** service, quality and price, you get the best hardware solution possible. **Personalized Service:** You will be assigned a SAG Integration Specialist who will be your single point of contact from pre- to post-sale. It's their job to know your system inside and out. **100% True Customization:** Everybody claims to offer customized solutions, but our systems are truly built to order; you specify it, we build it. **Warranty & Support:** Our 3-year extensive warranty rivals the industry giants – plus you'll speak directly to our own on-staff tech advisors. **Leading Edge Technology:** We are known for being first-to-market with the latest technology. **Best Price:** Our prices continually beat our competition, see for yourself at sagelectronics.com. **Top Quality:** We only use top-of-the-line components. That's why we've won so many awards. Here are just a few:

CADALYST LABS 4 1/2 STAR RATING Nov. 1998
BX Workstation

CBT EDITOR'S CHOICE
Nov. 1998
Xeon Rackmount

MVP PCComputing Finalist
Xeon Workstation

PCComputing
November 1998
Xeon LVD Raid

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SAMPLE WORKSTATIONS

XEON EDITING & CADSTATION

- (1) Intel Xeon 450Mhz Processor
- 512KB Cache, Expandable To 2 CPUs
- 256MB SDRAM Expandable to 2GB
- Slots: (6) PCI, (1) ISA, (1) AGP
- (2) 9GB 10,000RPM LVD (5.0ms) Removeable HDs
- AMI LVD Ultra2 Raid 0-5 Controller
- #9 Revolution IV 32MB AGP 2X Video
- Sony 32X CD-ROM/Max
- Keyboard, Floppy, Mouse
- Full Tower 300 Watt

$4290

ES Galaxy 52MB Dual Port Solution $5370

STA DUAL XEON 450MHZ

- (1) Intel Xeon 450Mhz Processor
- 512KB Cache, Expandable To 2 CPUs
- 128MB SDRAM Expandable to 2GB
- Slots: (6) PCI, (1) ISA, (1) AGP
- Sound & Ethernet 10/100 by Intel
- (1) Matrox G200 16MB AGP Video
- IBM 22GB 7200RPM IDE
- Sony 32X CD-ROM/Max
- Keyboard, Floppy, Mouse
- Full Tower 300 Watt

$2581

NEW!

STA DUAL PII 500/BX

- (1) Intel Pentium II 500Mhz Processor
- 512KB Cache, Upgr. To 2 CPUs
- 128MB SDRAM
- Slots: (5) PCI, (2) ISA, (1) AGP, BX chipset
- IBM 10GB 7200RPM Ultra-33 Drive
- Sony DVD CD-ROM
- Soundblaster Live
- Subwoofer Speakers
- 16MB Diamond Viper 550 TNT Video
- Keyboard, Floppy, Mouse
- Mid Tower Chassis

$2159

SCSI Drive Solutions Available

STA DUAL 450/BX

- Pentium II 450Mhz with 512K Cache
- 64MB SDRAM
- Slots: (5) PCI, (2)ISA, (1)AGP, BX Chipset
- 10GB 5400 RPM Drive (ST38641A)
- #9 Revolution IV 32MB AGP 2X Video
- Sony CD Recorder/Rewriteable
- Keyboard, Floppy, Mouse
- Mid Tower Chassis

$1,718

STB CELERON 333

- Celeron 333Mhz w/128K Cache
- 32MB SDRAM
- Slots: (3)PCI, (3)ISA (1 shared), (1) AGP, BX Chipset
- Integrated: PCI Soundblaster 8MB nvidia Video
- 4GB IDE Hard Drive (ST34321A)
- Sony 32X CD-ROM/Max
- Keyboard, Floppy, Mouse
- Intel Landesk Management Software
- Desktop Chassis

$649

Celeron 433Mhz Solutions Available

TRUE CUSTOMIZATION 100%

SAMPLE SERVERS

RAID TOWER

- (1) Intel Xeon 450Mhz Processor
- 512MB Cache - Expandable to 4 CPUs
- 256MB ECC Memory, Expand to 4GB
- Slots: (7) PCI, (1) ISA • Integrated 2MB Video
- Integrated Dual Ultra 2 LVD SCSI Controllers
- 3 Chan. Ultra 2 LVD RAID Cont. w/64MB Cache
- (3) 18GB LVD 10,000RPM (5.0ms) Remov. HD
- Intel Server Adaptor
- Server Management System On-board
- 32X CDROM/Max • Keyboard, Floppy
- 9 Drive Bay Q; (6) 230 Watt Redundant Power Supplies

$10,952

Rackmount Solutions Available

STF DUAL XEON 450MHZ-RACKMOUNT

- (1) Intel Xeon 450Mhz Processor
- 512Kb Cache - Expandable to 2 CPUs
- 128MB ECC Memory, Expand to 2GB
- Slots: (5) PCI, (1) ISA (1) AGP
- 8 MB AGP Video
- Intel Server Adaptor
- Integrated Adaptec Ultra 2 LVD SCSI Controller
- 9GB LVD 10,000RPM (5.0ms) Removable HD
- 32X CDROM/Max; Keyboard, Floppy
- 4 Bay Rackmount 300 Watt Power Supply

$3400

STF DUAL XEON 450MHZ -RAID 5 SERVER

- (1) Intel Xeon 450Mhz Processor
- 512Kb Cache - Expandable to 2 CPUs
- 256MB ECC Memory, Expand to 2GB
- Slots: (6) PCI, (1) ISA (1) AGP
- Matrox G200 8 MB AGP Video
- Integrated Intel 10/100 Ethernet
- 3 Channel LVD RAID 5 Contr. w/16MB Cache
- (3) 9GB LVD 10,000RPM (5.0ms) Remov. HD
- 32X CDROM/Max; Keyboard, Floppy
- 13 Bay Tower Chassis 400 Watt Redund., Hot Swap Power

$7350

13 Bay Rackmount Solution $7500

STF DUAL PII 500/BX 36GB SERVER

NEW!

- (1) Intel Pentium II 500Mhz Processor
- 512KB Cache, Expandable to 2 CPUs
- 128MB ECC Memory, Expandable to 1GB
- Slots: (5) PCI, (2) ISA, (1) AGP - BX Chipset
- Integrated Adaptec Ultra2 LVD SCSI
- 36GB 7200 RPM HD LVD
- 8MB AGP Video
- Sony 32X CD-ROM/Max
- Keyboard, Floppy, Mouse
- Full Tower 300 Watt

$3518

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SAMPLE RAID SUBSYSTEMS

STC 8000

2 Channel RAID UW Controller • 8 Hot-Swappable Drive Bays • 2-300 Watt N+1 Redundant Power Supplies • 32MB Cache • Internal Temperature Status Power Supply Status • Cooling Fan Status • Visual and Audible Alarm:

27GB Solution	27GB Solution	54GB Solution
Q: (3) 9GB 7200RPM LVD HD	Q: (3) 9GB 10,000RPM (5.0ms) LVD HD	Q: (3) 18GB 10,000RPM LVD HD
$6370	$6840	$8351

STC 20 BAY

Active/Active Controllers • Q: (2) 4 Channel RAID 5 UW Controllers • 8 - 230 Watt Hot Redundant Power Supplies • 128MB of Cache Internal Temperature Status • Power Supply Status • Cooling Fan Status • Visual and Audible Alarm

72GB Solution	72GB Solution	144GB Solution
Q: (8) 9.1GB 7200RPM LVD HD	Q: (8) 9GB 10,000RPM (5.0ms) LVD HD	Q: (8) 18GB 10,000RPM LVD HD
$18,750	$20,300	$24,498

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WATCHDOG

▶ Maximum PC takes a bite out of bad service and gear

ILLUSTRATION BY SCOTT LAUMANN

NO 3D DISTRIBUTION

DEAR DOG I have been working with a company called **3D DISTRIBUTION** trying to get hardware sent to me that I have already paid for.

I purchased a CD-R drive from 3D for $700, but returned it two days after the 15-day return period. I agreed to take a $500 credit on the drive, losing $200 to restocking fees, and then ordered a 350MHz Pentium II, Abit motherboard, and AGP videocard.

The merchandise was apparently sent, but it was lost by UPS. UPS issued a check to 3D, and I expected to soon hear a "Yes Robert, we will send the merchandise out to you... expect to see it in a few days." Not!

Be mindful of return deadlines and restocking fees when ordering via the net. One reader lost $200 on the CD-R drive he bought.

When I called the company, a woman answered and said 3D Distribution had gone out of business. She said the company hired her to answer the phone and break the news to customers. This came as a shock to me because I had spoken to the manager, a Mr. Gordon, just a few days before about my order, and he didn't mention the company going out of business.

I e-mailed the contact address on 3D's web site a trillion times, but never received a response. I'm about ready to buy a plane ticket to Houston to issue some payback. I've already contacted an attorney—I'm in the Air Force and the lawyers are free—but I haven't heard anything back. I don't know what else to do, should I go to the BBB?

—Robert D. Watson

THE DOG RESPONDS **Losing $200 by blowing the return deadline is painful. The Dog's advice to anyone purchasing over the Internet or by mail order is to pay very close attention to restocking fees and return deadlines. Restocking fees of 15% to 20% are standard and hard to argue away. Refund deadlines are very hard and very real. When you get that new motherboard, don't let it sit for three weeks while you wait for the next über-videocard. Slap it together and fire it up, keeping the deadline in mind.**

Your situation is still untenable, though. The Dog called 3D Distribution's phone number and got the run around as well from the "receptionist," who told me I couldn't speak to the owner unless I was a customer.

The Dog was able to confirm through public record searches that 3D Distribution wasn't a born-last-week Internet company. State records confirm the company's claims that it has been around since 1993, although under different company names. State records also showed that David Gordon isn't just the manager, but the owner of 3D Distribution. Since the receptionist refused to forward calls, the Dog decided to call Gordon at home in Houston. Although contacted in the evening, Gordon was cordial and immediately remembered Watson's situation. "You mean that hasn't been taken care of?" Gordon asked the Dog. Gordon said 3D Distribution had been waiting for UPS to reimburse the company before sending a refund to him. In the meantime, 3D Distribution went out of business. Gordon promised to have a refund check issued within a couple of days. What put 3D Distribution under? Gordon said it was the decreasing margins from the sub-$1,000 PC market.

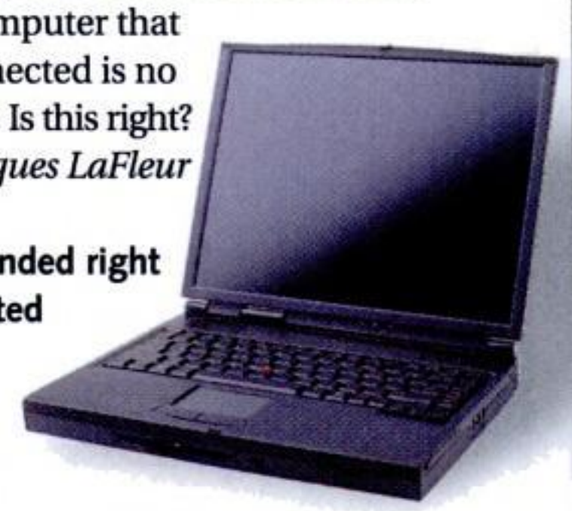
The Dog contacted Watson two weeks later. Watson said 3D Distribution had mailed a check within two days of the Dog's conversation with 3D Distribution. Watson is happily cruising for new components from where he's now stationed—Saudi Arabia. Aroof.

EPS TECHNOLOGIES EVAPORATES

DEAR DOG I purchased a notebook, along with a three-year warranty, from **EPS TECHNOLOGIES** for just over $3,000 in March 1998. When the machine began smoking and making popping noises, I sent it in for repair. Instead of getting a fixed notebook back from EPS, the company told me it would cost about $800 to fix the machine because I had a "third-party device" attached. That third-party device was an Iomega Zip drive on the parallel port and a printer!

How can a company say that the warranty is void because I had a printer and Zip drive attached to it? That would then mean that any computer that has a Zip drive or printer connected is no longer covered under warranty. Is this right?

—Jacques LaFleur



"How can a company say that the warranty is void because I had a printer and Zip drive attached to it?"

THE DOG **didn't think it sounded right either. To investigate, I contacted several legitimate major notebook vendors—Compaq, Toshiba, and NEC—and none said a parallel-port device would cause the kinds of problems LaFleur experienced. The local BBB, however, sided with EPS, even though LaFleur's warranty didn't mention third-party devices.**

EPS was unresponsive, but the Dog finally reached a human after leaving repeated messages for the president of the company, Ed Kieler. The service person said The Dog did not have the full details of what "really" happened with the notebook. Before EPS could

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prove its case, the company vanished. The Omaha BBB and local paper reported that EPS had shut its doors unexpectedly and laid off some 75 workers. Windows of the building were sealed with paper, and equipment in for warranty work was returned to customers in the same shape it was sent, according to the Nebraska Attorney General's Office. Furthermore, all warranties were rendered null and void. Neither the AG, Postal Inspectors, nor Omaha Police were investigating because there is no indication of fraud or foul play.

The company, which did some $80 million in sales in 1998, did not file for bankruptcy by privately settling its obligation with creditors, according to EPS's attorney, Doug Quin. So what about the customers?

"Everybody should have their equipment back," Quin said. "There just wasn't enough coming in and more going out."

There isn't much recourse for customers stuck with busted EPS notebooks but to turn to the vendor who made the computers for EPS. Chicony America in Irvine, CA, manufactured many of the notebooks for EPS. Chicony will repair notebooks for a fee, and its web site has many drivers available. EPS customers who want a quote on a repair may contact Anthony Duong at Chicony at 402.341.3070.

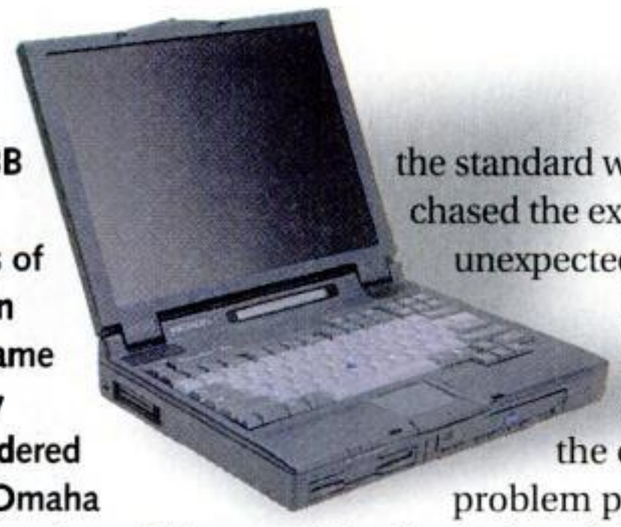
STARGATE 2000 UPDATE

The saga of **STARGATE 2000** general manager Igor Abramovsky continues. Abramovsky pleaded guilty to mail fraud, threatening customers over the Internet and by phone, and making false statements to the FBI. A federal grand jury indicted Abramovsky for allegedly trying to execute a "scheme and artifice to defraud customers of (Stargate 2000 and Computer-Star) and to obtain money by false pretenses, representations, and promises." How bad did it get? According to an affidavit filed by the FBI, Abramovsky allegedly told one customer who called for help from Stargate 2000 that "We know who you are. We know where you live. If you keep messing with us, we will kill you." Abramovsky faces five years in federal prison and/or a fine of $250,000 for each of the three counts he pleaded guilty to. Woof.

MICRON GETS A DOG TREAT

DEAR DOG I purchased a **MICRON** laptop with a 13.3-inch screen about a year ago. After about six months of use, a black rectangular shape appeared near the center of the screen, rendering it fairly useless. After contacting Micron, I returned the unit for warranty repair per their instructions.

After inspecting the unit, Micron refused to honor the warranty, saying misuse, mishandling, or abuse caused the problem. They were, however, willing to install a new screen for a mere $2,400. I was assured that this was a very unusual occurrence and not in any way representative of a problem with this particular screen or laptop model. I opted for them to return the unit instead, even though I was still covered by the standard warranty, and had even purchased the extended warranty in case of unexpected problems. Ha-ha on me.

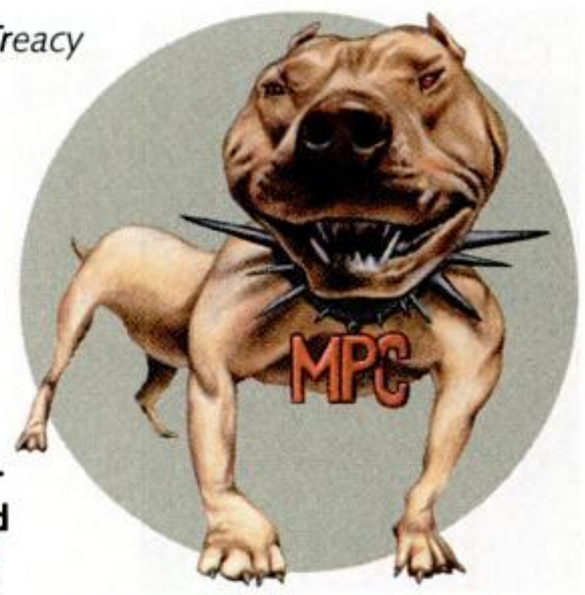


Micron notebook

My position in this matter is that I in no way abused or mistreated or mishandled the computer. Rather, the problem probably relates to a poor design of this particular model, in that the top of the computer when the unit is closed is quite soft and flexible, offering little or no protection to the screen. Micron turned a deaf ear to any further discussion in this matter and that's how it stands.

Is there anything that can be done to rectify this very one-sided situation?

—John S. Treacy



"I was still covered by the warranty and had even purchased the extended warranty in case of unexpected problems. Ha-ha on me."

THE DOG contacted Micron to find out its policy in investigating customer complaints about its products. According to Ken Knotts, Micron's Review Manager for Portables, it's not Micron's policy to blame the customer, and he was kind enough look into Treacy's complaint.

According to Knotts, Micron's warranty-repair department determined the screen had suffered a fracture caused by an impact with the pointing stick. Such fractures, Knotts reasons, are generally caused "by putting too much weight on top of the notebook, or from dropping it." But after speaking to Treacy again—who assured us the notebook was never dropped or mishandled in any way—Micron agreed it was possible the damage was done "unintentionally."

Treacy's letter was then sent to the "Office of the President," which exists solely to resolve these sorts of complaints and customer frustrations. After reviewing the original technical support documentation, and consulting with senior engineers and customer support staff, Micron decided to send Treacy a brand new—and faster—notebook, free. However, Knotts stressed that "since the LCD is an inherently breakable device, customers should always take care when using or transporting the notebook."

As a result of our investigation and other similar complaints, Micron said it plans to make some significant changes to its notebook customer-support policies. First off, it plans to offer an LCD insurance program. For a nominal fee, you'll be able to purchase LCD insurance that will cover the screen, regardless of what happens to it, for a period of three years. The LCD insurance program will begin rolling out later this year. The company also promises to start bringing in product engineers and marketing staff earlier in the customer-support cycle, in the hopes of resolving such complaints expeditiously.

After hearing the good news, Treacy thanked Micron for its generosity and said his confidence in the company was once again restored. Case closed. Aroof.

Got a bone to pick with a vendor? Get spiked by a fly-by-night operation? Sic the dog on them by writing **watchdog@maximumpc.com**. The dog promises to get to as many as possible, but only has four paws to work with.

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ABOVE ALL, ELSA.

Be honest, you ever see what 16 megs of frame buffer and a 32-bit color TwiN-Texel pipeline does to 3D? Check out the new ELSA *ERAZOR III* graphics accelerator with the NVIDIA RIVA TNT2 processor. It runs 3D at an unheard of 2048 x 1536 resolution and 2D that makes all the other stuff a dream. Is it fast?...heh...heh...heh.

ELSA

800.272.ELSA or www.elsa.com/AMERICAS

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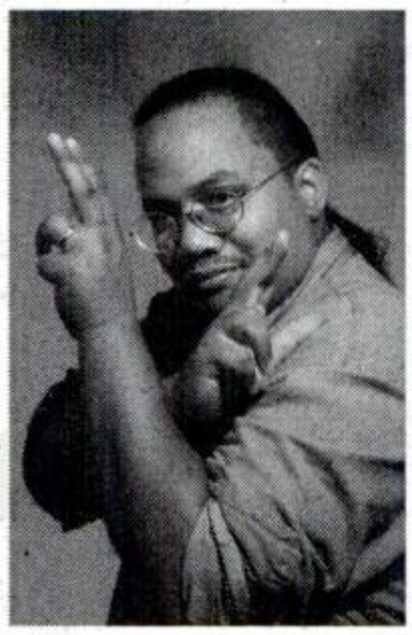
PURE PC POWER boot

boot REPORT

INSIDE TECH FOR ADVANCED PC OWNERS



3Dfx's Decline & Fall

3Dfx's original Voodoo technology enjoyed the longest undisputed reign of any 3D chip maker thusfar. From late 1996 until well into 1998, Voodoo was de rigueur for power users. And when alternate technologies from Intel, nVidia, ATI, and others, started closing in on Voodoo's performance, 3Dfx parried with its own Voodoo killer—Voodoo^2.

As the premier *Quake II* and *Unreal* accelerator, the Voodoo^2 earned a place in every hardcore technophile's system, but the combination of a brutal price war between board vendors and intimidating new hardware from nVidia cut Voodoo^2's reign short—much shorter than 3Dfx expected.

At last year's Comdex, 3Dfx announced its response: Voodoo^3. Folks familiar with 3Dfx's silicon heritage know that Banshee, 3Dfx's original integrated 2D/3D video chip, was based on a single texelfx2/pixelfx2 graphics pipeline, robbing it of multitexturing abilities. Voodoo^3 is Banshee with a second texelfx2 unit integrated into the core, making it a true single-pass, multitexturing device. Think of it as Banshee done right.

"Voodoo^3 should have been 3Dfx's next dominant 3D technology but on paper this pretender to the throne isn't up to the task of defending the kingdom."

Voodoo^3 should have been 3Dfx's next dominant 3D technology—the silicon Excalibur that would smite all who would dare try to usurp its 3D crown, but on paper this pretender to the throne isn't up to the task of defending the kingdom.

Once known for a performance-driven "silicon be damned" attitude, 3Dfx now promises silicon based on price and timing. Sure, Voodoo^3 will run the old 16-bit applications at triple-digit framerates. But what's performance without features? This will be the first time that a next-generation Voodoo will not be first in feature set: Integrated 2D/3D with Glide support? Banshee already did that. Support for 16MB of local memory? nVidia's TNT beat them to it. Dual graphics pipeline in a single ASIC? Sorry, nVidia beat 'em again with TNT. Texture compression? S3's Savage3D's been there, done that... and Voodoo^3 won't even do it.

The worst thing about Voodoo^3 is how it will dictate 1999's games. 3Dfx insists it doesn't tell developers how to make their games.

Right.

When your technology is considered the best game makers will develop around your specs. They'll design around your strengths and weaknesses. Witness the countless developers who've cited Voodoo/Voodoo^2 technical limitations as a reason not to use textures larger than 256x256. In games such as *Quake* or *Thief*, a larger texture resolution results in less visible pixelation. Imagine walking up to walls, monsters, or weapons and seeing them with crisp detail, not filtered crap! If 3Dfx has its way, you'll be squinting at low-res textures well into 1999.

And without true-color rendering, lighting effects and textures will exhibit banding. 3Dfx claims you'll see a 50% performance hit with true-color rendering. Personally, I'd rather have 60fps 32-bit rendering as opposed to 120fps 16-bit rendering.

In the dance of technology, hardware and software take turns leading. Killer cards allow designers to push the envelope, and in turn, demanding games require cutting-edge hardware. So, it's up to game developers to stand up against 3Dfx's subversive arm-twisting. Don't be afraid: use high-resolution textures. Banish banding artifacts with 24-bit textures. Dabble in texture compression. Bottom line: Don't be a slave to Voodoo^3's limitations.

When confronted with allegations of limpness, 3Dfx is quick to state it has a tight release schedule to keep. It needed to release Voodoo^3 by Q2 of 1999. Funny... that sounds like marketing telling the engineers how to make a chip.

By placing ship dates over performance and features, 3Dfx disregards the hardcore fanatics who put them on the map in the first place. And, by licensing its chipset exclusively to STB, 3Dfx has killed off the healthy competition that allowed Voodoo^2's innovative designs and performance enhancements. Don't worry 3Dfx, Canopus, Metabyte, Hercules, and the others you shut out by purchasing STB, will do something special with S3's Savage4, nVidia's TNT2, and NEC's PowerVR 250. And 3Dfx will soon find out technofiles are a finicky lot who will pledge allegiance to whoever delivers the goods. b —*Andrew Sanchez*

In This Issue

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B8 ▶ bootLAB: Taming a Wild CPU

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The Importance of Being MPEG

MPEG technology in all its many flavors has never been hotter. Not only is it the video and audio compression method delivering high-quality movie content via DVD and video content over the Internet, but it also offers the best cross-platform compatibility. And MPEG's outstanding "lossless" compression algorithms are responsible for igniting the recording industry with a slew of copyright suits.

If you're wondering what an MPEG file looks like, keep an eye out for the .MPG extension on video files, and .MP2 or .MP3 for MPEG Audio files. If you haven't seen these, you will soon, because MPEG, even the older MPEG-1 standards, are seeing a new dawn.

MPEG is an acronym for the Motion Picture Coding Experts Group, which was established in January 1988 under the sponsorship of the International Organization for Standardization (ISO) and the International Electrotechnical Commission (IEC) with the sole purpose of developing standards for the digital coding of moving pictures and audio. Twenty-five members were present at the first meeting in May 1988. Since then, the group has grown to more than 350 experts from 200 companies in more than 20 countries.

MPEG offers the highest video and audio compression ratios—up to a whopping 200:1 (see sidebar for how MPEG compression actually works). More importantly, MPEG does this without sacrificing audio and video quality. Since it's an international standard, cross-platform compatibility isn't an issue. There are several different flavors of MPEG, and each targets specific applications, based on the required transmission rates, as well as the number of colors, pixels per frame (resolution), and framerates.

—Sean Cleveland

BIT RATE

Data compression is often explained in terms of bit rates, or the speed at which data moves in bits per second (bps). Since a byte is made up of eight bits, you can use simple math to figure out bit-rate conversions. A 200Mbps (megabits per second) video transfer rate divided by 8 (eight bits per byte) yields a megabyte equivalent of 25MB/sec. So, converting a 1.5Mbps transfer rate to bytes would give you .1875MB/sec, or 192K/sec (.1875MB multiplied by 1,024KB/MB), which is slightly faster than a single-speed CD-ROM drive.

You can also determine the amount of time an audio or video file will play if you know both the file size and the streaming data transfer rate by taking the file size in MB and dividing it by the data transfer rate in Kbps. So, a 50MB MPEG file that streams at 1.5Mbps would take approximately 4 minutes 27 seconds (51,200K ÷ 192K/sec = 267 seconds).

MPEG-1

Finalized in 1992, the first MPEG standard was created to reduce the bit rate of digitized television signals so they could be played directly off CD-ROM drives, which delivered data at a paltry 150K/sec (or 1x). A mere 74 minutes of digital audio fills a CD, even without video. The challenge is to deliver both in significant quantity.

To understand this very uphill battle, you need to realize that a broadcast-quality signal bit rate is greater than 200Mbps and requires a bandwidth of at least 25MB/sec to play back without dropped frames. Even current hard drive technology can't deliver this throughput without additional technology backing it up, such as RAID. The MPEG-1 standard published in 1993 was able to produce a VHS-quality picture (Standard Image Format, or SIF, spec) at 352x240 and 30fps (frames per second) that only required a bit rate of 1.5Mbps. MPEG-1 is strictly meant for progressive displays such as computer monitors and not interlaced scanning devices such as TVs.

Interlaced displays join two separate field scans to form a single video frame (the first field contains even scan lines, while the second contains odd scan lines). When a video is displayed, both sets of fields are laced together to form a complete frame. Progressive displays (also known as noninterlaced displays) aren't as hard on the eye, delivering a higher-resolution picture by drawing horizontal lines across the screen in rapid succession.

When looking at the specs, it's difficult to see why MPEG-1 didn't catch on and become the de facto standard. Perhaps MPEG was just too ahead of its time. Even without the bottleneck issue, the data stream still had to be decompressed, and that process was intensive at a time when CPUs weren't very powerful. In fact, MPEG-1 decompression initially required dedicated hardware. It's only recently, with PCI and AGP videocards and faster CPUs, that MPEG-1 video could be decoded properly through software and, even more impressively, directly in Windows through the DirectX ActiveMovie API.

MPEG-1 also had to overcome steep equipment requirements for encoding. Since only a select few content providers were able to encode MPEG-1, content was sparse, which didn't help proliferation.

MPEG-2

MPEG-2 (ISO/IEC 13818-3), published in 1995, is responsible for delivering both satellite television broadcasts such as DirectTV and theatrical movie content on DVD.

Like MPEG-1, MPEG-2 was ahead of its time when first announced. Initially used solely by video professionals, MPEG-2 has recently found a home with DVD's spacious capacities. MPEG-2 was designed to deliver broadcast-quality video and audio at 720x480 (CCIR 601) and 60fps at a bit rate from 2Mbps to 10Mbps. MPEG-1 is approximately one-fourth that resolution.

MPEG-2 can be decoded via dedicated hardware or through software with heavy CPU assistance. Soft DVD—as it's referred to—requires a Pentium II in at least the 350MHz range. Anything less means artifacting, tearing, dropped video frames, and even audio misalignment. Soft DVD also has problems resizing resolutions.

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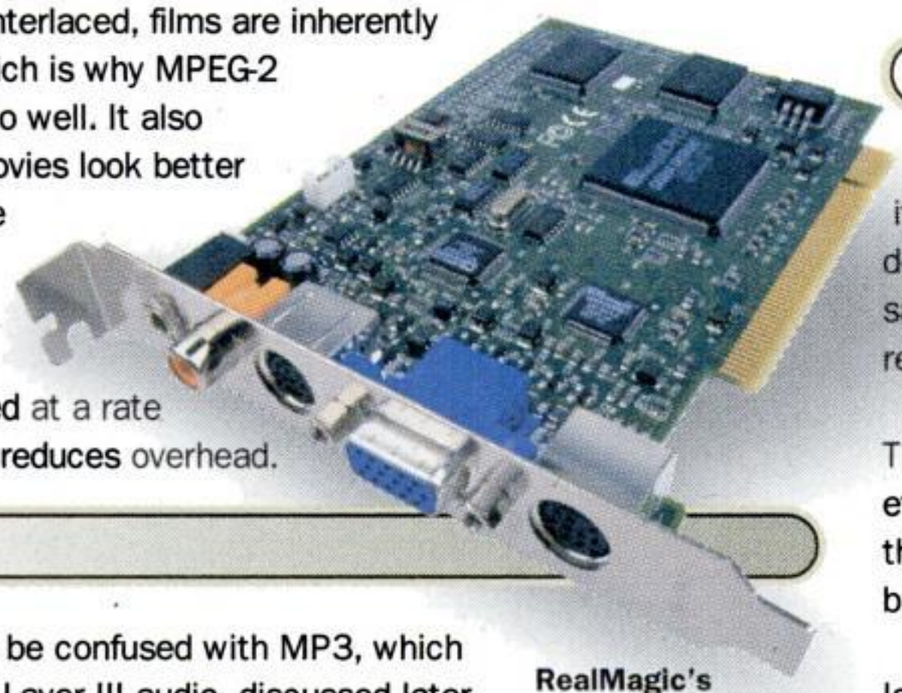
	BIT RATE	RESOLUTION
MPEG-1	1.5Mbps	352x240 pixels
MPEG-2	2Mbps to 10Mbps	720x480 pixels
MPEG-4	4.8Kbps to 64Kbps	176x144 pixels up to 320x240 pixels

While MPEG-2 can use video sequences that are either progressive or interlaced, films are inherently progressive, which is why MPEG-2 decodes them so well. It also explains why movies look better on a progressive computer monitor than a TV. Also, films are only recorded at a rate of 24fps, which reduces overhead.



RealMagic's Hollywood+ MPEG-2 decoder kicks ass, especially to progressive displays.

MPEG-3

MPEG-3 (not to be confused with MP3, which refers to MPEG Layer III audio, discussed later in MPEG Audio) was created for the high-bandwidth video HDTV requires. Spec'd for 1920x1080 and 30fps at bit rates between 20Mbps and 40Mbps, MPEG-3 was canned when MPEG members figured out how to tweak MPEG-2 to handle these requirements.

MPEG-4

The MPEG group began developing MPEG-4 in 1994 with a mandate to standardize both audio and video algorithms and the creation tools. Even though MPEG video and audio is theoretically playable across platforms, the algorithms used to create them can be proprietary, not based on an open standard. Special features targeted for the MPEG-4 spec include accessing data as web content and the ability to mix pixel-based audio/video with synthetic audio/speech technologies such as MIDI and Text-to-Speech. Small bandwidth requirements over wires such as Internet dial ups call for very low bit rates, so the standard includes a maximum resolution of 320x240 pixels and 30fps with bit rates between 4.8Kbps to 64Kbps for mobile applications on up to 2Mbps for TV/film applications.

In fact, Microsoft will soon release a multithreaded MPEG-4 video codec for the Windows NetShow Encoder that is optimized for the new Pentium III processors. This would make the viewing of video across the net much less jerky.

MPEG-7

MPEG-7 won't be finalized until the end of 2000. There's not much information yet except that it's not meant to replace any of the previous standards. The MPEG group defines MPEG-7 as "not being a representation of the content itself (the bits), but rather a representation of the information about the content (the bits about the bits)." Description information such as how various video and audio elements are to be combined allow apps such as musical dictionaries, personalized news services, and multimedia directory services such as interactive yellow pages to be developed using MPEG-4.

MPEG Audio

MPEG Audio is a perceptual audio coding scheme. This means that it doesn't attempt to retain the exact input signal after encoding and decoding. Audio encoding ensures that the output signal *sounds* the same to the human ear. By using auditory masking, MPEG encoding removes signal portions that are inaudible to the human ear.

MPEG Audio is separated into three classifications, called Layers. The complexity of the encoder/decoder and the delay and coding efficiency increases as you go from Layer I to Layer III. This means that a Layer III decoder can play both Layer I and Layer II bit streams, but not vice versa.

MPEG Layer I was made for playback technologies that utilize lower-quality audio signals, such as the Sony MiniDisc and Philips Digital Compact Cassette (DCC). The bit rates supported range from 32Kbps to 448Kbps, although the sweet spot is 192Kbps per audio channel (384Kbps).

MPEG Layer II is aimed mostly at satellite broadcasting, such as Hughes DSS and CD-Video (White Book), offering a trade-off between performance and complexity. Bit rates supported range from 32Kbps to 384Kbps with the sweet-spot using 128Kbps per audio channel (224Kbps).

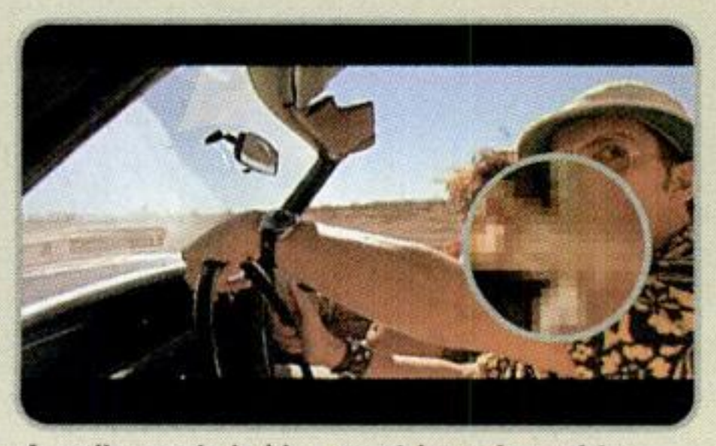
With its low bit rates, **MPEG Layer III** (MP3) is aimed at Internet audio applications, even though the frequency resolution is 18 times higher than Layer II. Layer III bit rates range from 32Kbps to 320Kbps with the sweet spot using 64Kbps per audio channel (128Kbps). MPEG Layer III also features variable bit rate recording as well as several advanced features to preserve sound quality, and delivers the best performance at "low" bit rates. MPEG Layer III's ability to record "CD-quality" audio with high compression has made it the unofficial standard for Internet audio fans.

MPEG-2 AAC is a newer audio standard that provides high audio quality at a rate of 64Kbps/channel for multichannel operation. With the total number of channels numbering up to 48, MPEG-2 could replace the AC-3 standard as DVD's audio format of choice, since it delivers superior compression and finer frequency resolution.

MPEG-4 audio is slated to integrate synthetic and natural coding. This would combine MIDI and Text-to-Speech technology with 3D localized sound and the creation of sound environments that use both artificial and natural sources. MPEG-4 Audio is spec'd at bit rates that range from 2Kbps to 64Kbps. With this technology, a listener could choose to listen to only a few of the instruments in a composition (each containing its own signal) or to the same program in a variety of languages.

HOW MPEG COMPRESSION WORKS

Digital video is usually compressed from an analog source like a television signal or film by encoding it into a series of ones and zeros. Compression is then applied to reduce the overall size of the video, although the highest compression ratios are achieved by stripping out redundant information from each frame. An example of redundant information would be an object that remains static from one frame to another (like a panning shot of a car). By using a technique dubbed "lossy compressio," the static object's information only needs to be recorded once and then the image info is carried into each subsequent frame.



A well-encoded video must be enlarged to detect any aftifacting, shearing, or diminished integrity.

In another MPEG compression technique called Discrete Cosine Transform (DCT), each frame is divided into blocks where the pixel intensities are determined and converted into an equivalent frequency. What's left are a series of numbers that represent the details of each pixel block. By eliminating numbers after a certain point in the series the image series is compressed. This highly compressed video is stripped of very fine detail that's usually not detectable by the human eye. In fact, over 99% of the information in a video can be discarded without seriously affecting picture quality. This is how ratios of up to 200 to 1 are achieved.

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How to Make a Movie

People are finally getting excited about digital filmmaking, and there's a lot to get excited about. Making movies on a PC is so easy that you could easily become your own production studio. But you'll need to learn the basics before Sundance calls.

In the following 12 Steps, we fill you in on how to edit a short film. To check out what we're going to cover here, look at the finished video on this month's Maximum CD.

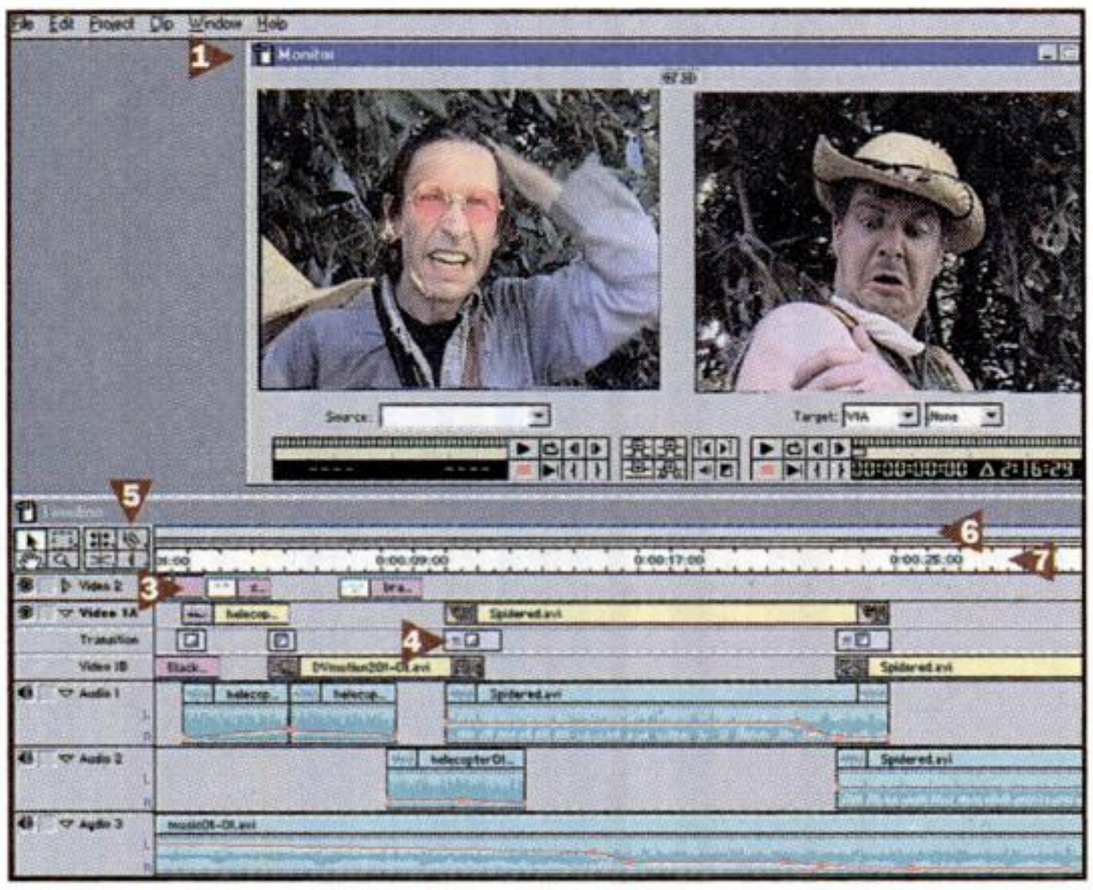
When you're ready, create a folder on your desktop and copy over all the contents from the Spidered *directory on the Maximum CD. Our video editor of choice for this tutorial is* Premiere 5.1*, and we've supplied a save-disabled version on the Maximum CD.*

—Rick Popko

STEP 1

Get up close and personal with Premiere

Don't be frightened by the intimidating interface screen. *Premiere* is actually one of the easiest applications you'll ever learn.



1. **The Monitor is used to preview the video that's brought into the application.**
2. **The Timeline is where the movie is assembled.**
3. **The Title track is where titles are placed.**
4. **The Transition track is where transitions are placed.**
5. **The Razor tool cuts clips within the Timeline.**
6. **The Render Bar gives you a rough preview of how your movie is looking so far.**
7. **The Ruler is where you scrub to see your video in realtime.**

STEP 2

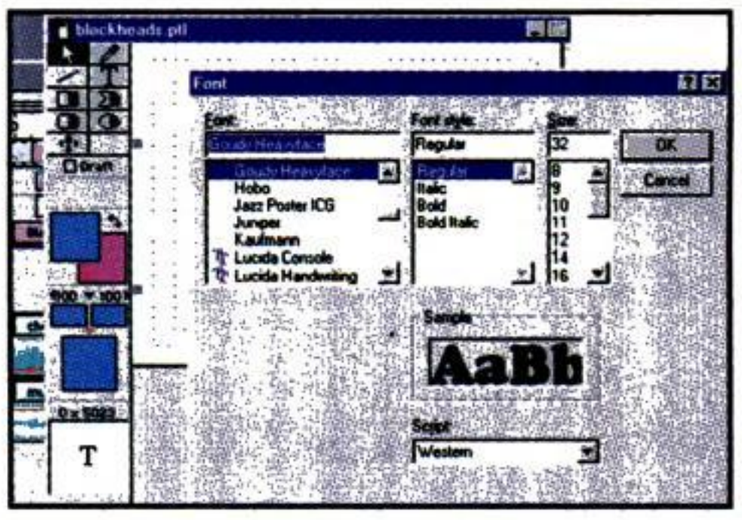
Fade in

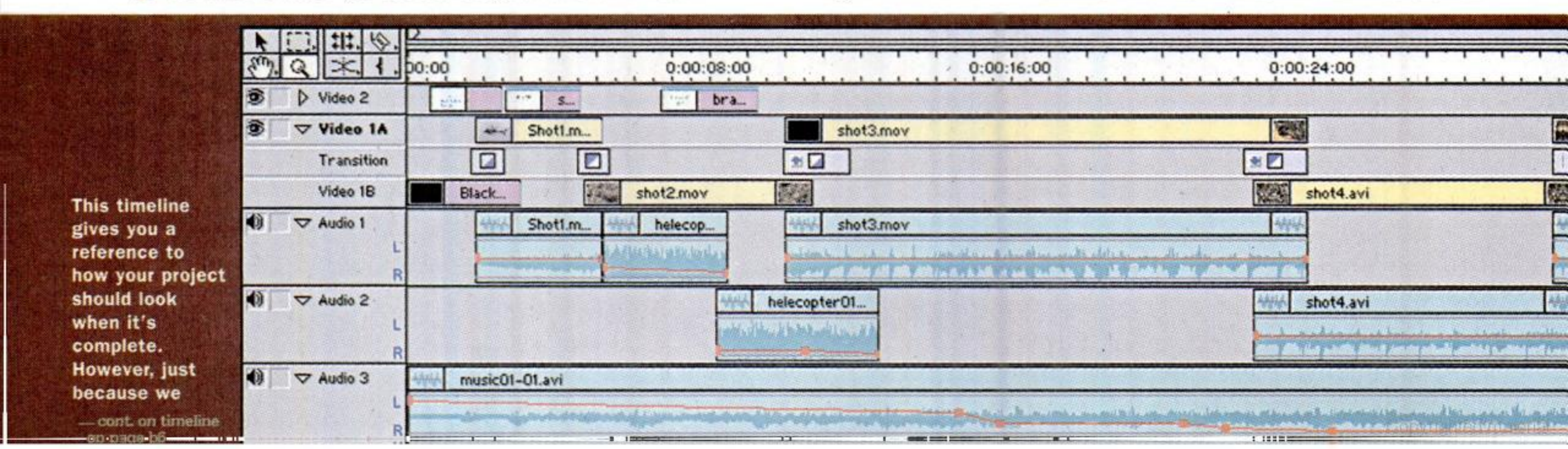
Like many movies, our project begins with a black screen, a title, and a fade in to the show. To do this, open the BLACK-BACKGROUND.TIF in the SPIDERED directory. After it comes up, you'll notice a small duration button in the lower left-hand corner of the window. This button lets you designate how long you want the black to last in your finished product. Set it to three seconds. Hit return and then drag the black background from its window to Video 1B on the timeline.

STEP 3

Creating a title

To create a title, open the Blockheads Present title (BLOCKHEADS.PTL) from the SPIDERED directory. We've created the titles for you, because you can't make titles within the demo version of the software you're using. To get the title to the Timeline, hold down the Ctrl key, left click, and drag and drop the title to the Video 2 track. If you place the cursor to the left or to the right of the title





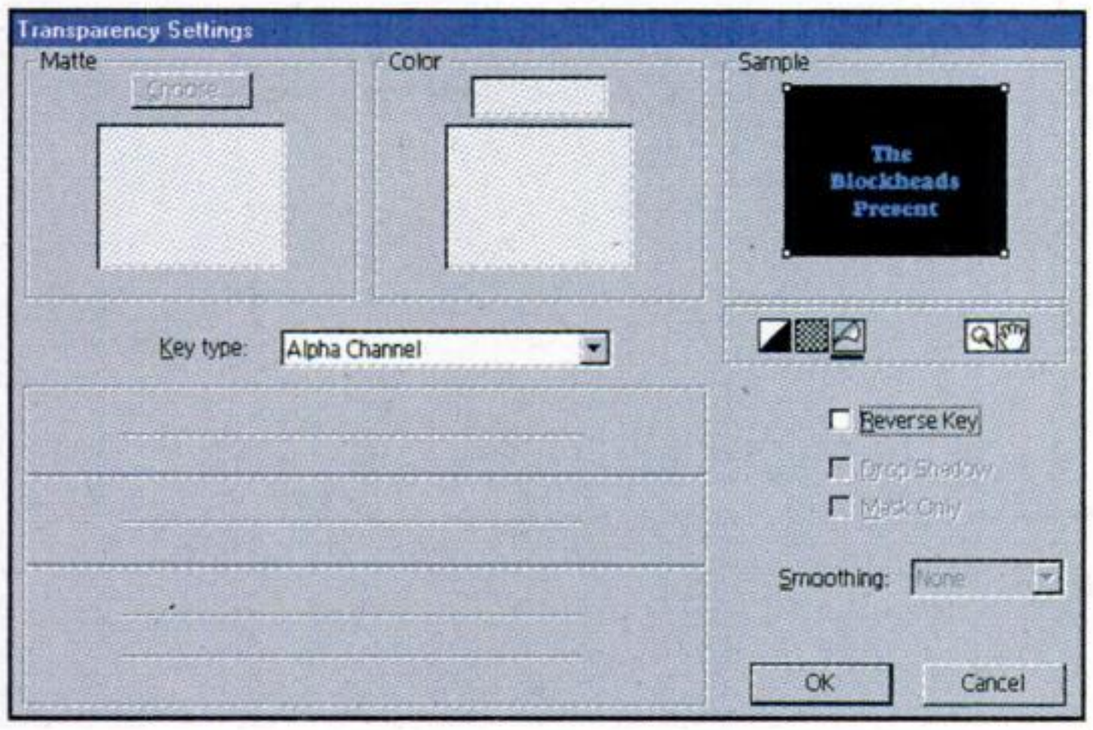
This timeline gives you a reference to how your project should look when it's complete. However, just because we

—cont. on timeline

clip, the cursor will change into a bold line with smaller arrows appearing on either side of it. This is where you adjust the amount of time you want the title to stay on the screen.

STEP 4

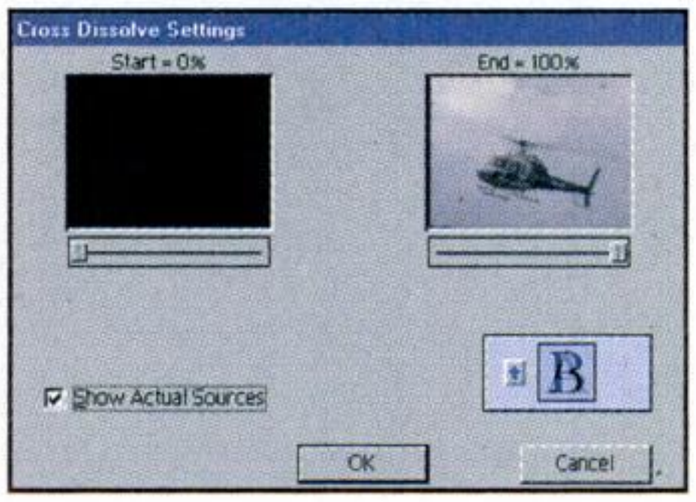
Using the alpha channel



We're going to use *Premiere*'s Alpha Channel to get rid of the white matte behind the title. To get there, highlight the title clip, right click, scroll down to Video, then select Transparency. A popup window shows your title against the white background we're going to remove. Select the Overlay button (In the row of three boxes, the Overlay button is the last one on the right). Under key type, choose Alpha Channel. You should now see your black background behind the title.

STEP 5

Transition from black



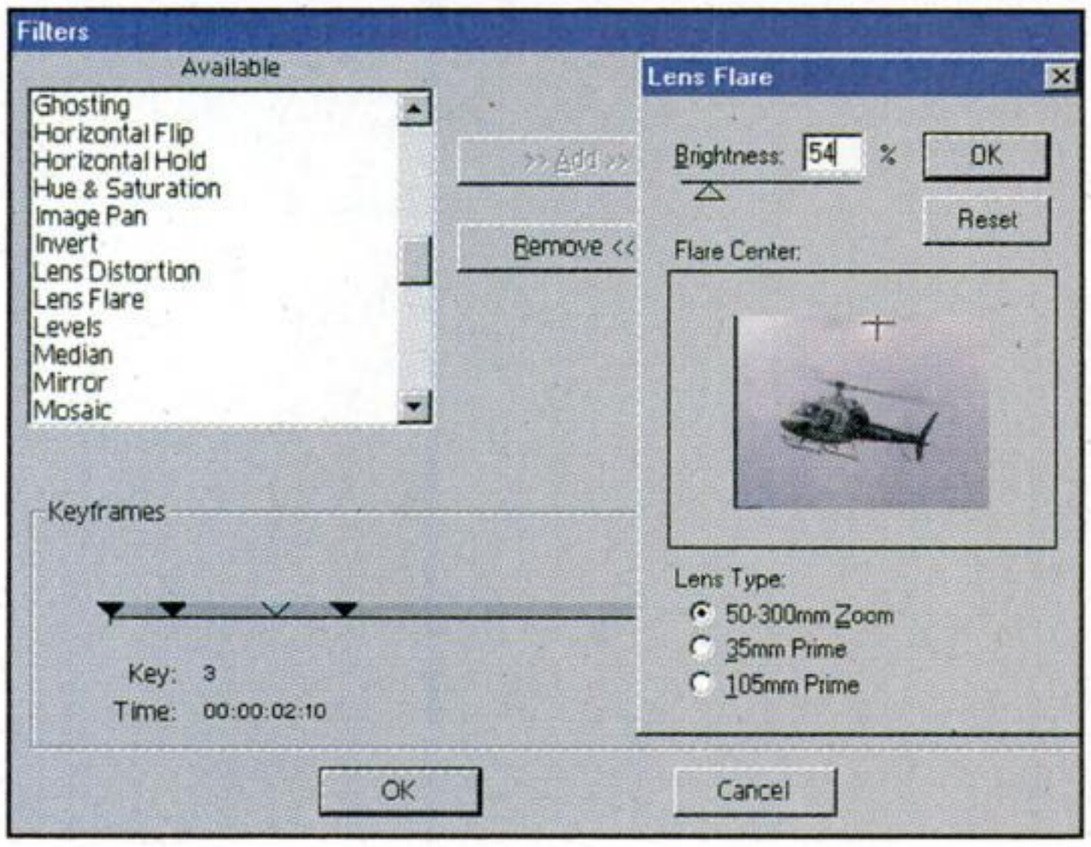
The easiest way to create a fade in is to use a transition. Just open up the Transitions window, select Cross Dissolve, and drop it on the timeline in the Transition track. You can change the duration of the cross dissolve the same way you changed the duration of the title. Now open the first shot (SHOT1.AVI) from the SPIDERED directory. A still of a helicopter should appear in the left-hand side of the Monitor window.

Drag the clip from the Monitor window to the Video 1A track on the Timeline. You want the helicopter shot to slightly overlap the black shot in order give the black background something to fade into. To make sure the cross dissolve is set up properly, double-click on the icon between the two tracks and check to see if the transition is going from B to A. You can preview it in realtime by selecting the "Show Actual Sources" box.

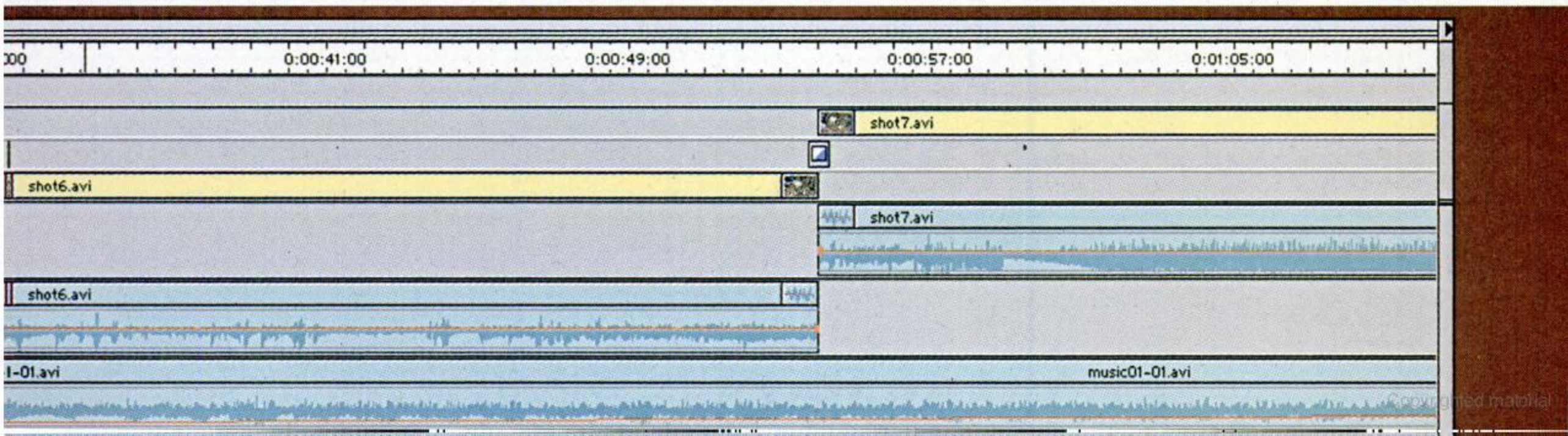
To view your work at any time during this tutorial, you can do a preview render by hitting the return key. Just make sure the blue bar between the ruler and the top of the timeline is stretched across the shots you want to render.

STEP 6

Adding special effects



If you look closely at the helicopter shot in the final film, you'll notice a lens flare that isn't in the original shot. We created this special effect with the Lens Flare filter. Just right-click SHOT1.AVI on the timeline and select Lens Flare from the list of filters. You'll need to choose where you want the effect to begin by dragging the crosshairs. After selecting you'll see a keyframe timeline appear at the bottom of the filter screen. Use this to plot the movement of the lens flare. Selecting another section of the keyframe timeline brings the lens flare box back up, allowing you to place the lens flare so it can appear to track along with a panning camera shot (see lens flare screenshot). When you do a preview render, you'll see that the program fills in the gaps between the two keyframes, making it look like the lens flare is moving with the helicopter.



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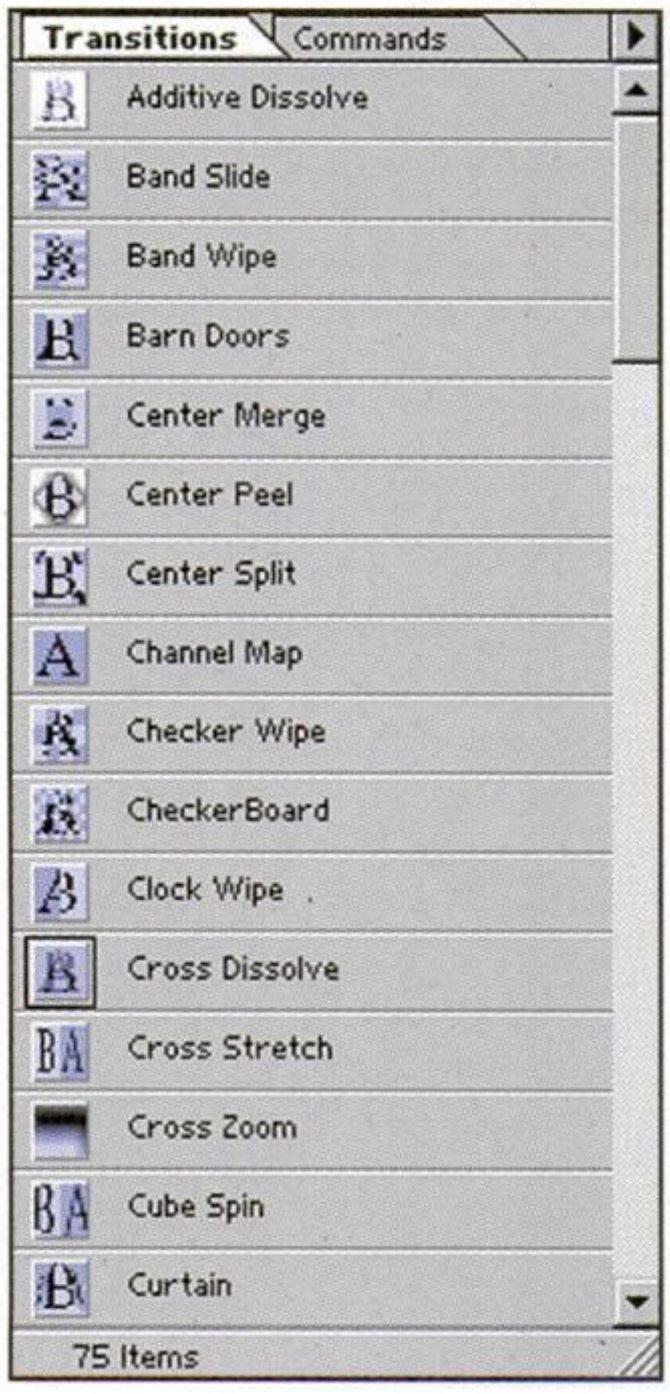
STEP 7

Using transitions

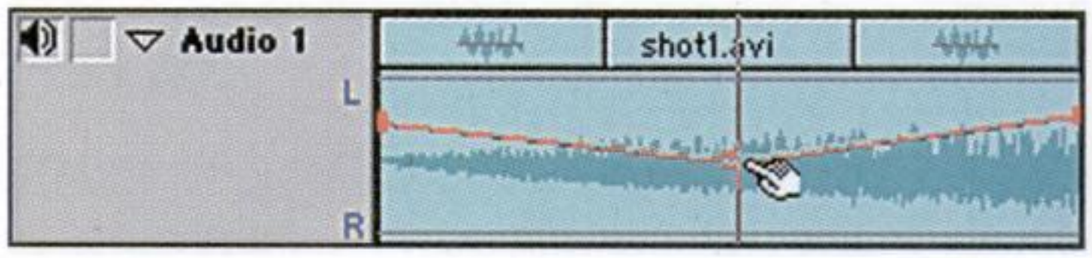
Transitions are a cool way to create the illusion of time passing, even though only moments have transpired on screen. To do this, bring in the second shot (SHOT2.AVI in the SPIDERED directory) and drop it on the Video 1B track on the time line. Because transitions use some footage from the previous track and some footage from the second track, we're going to want to align shot 2 so that it slightly overlaps shot 1. Next drop a Cross Dissolve on the transition track between the two clips. The transition should lock itself into place between the two tracks. Verify that it transitions from A to B the same way you did in Step 5.



STEP 8

Playing with audio

In the final movie, we want the second shot to take the viewer inside the helicopter as it flies over a bunch of trees. Unfortunately the second shot wasn't filmed from inside a helicopter. It was taken from inside a gondola. To trick the viewer into believing we were inside a helicopter, we simply copy and paste the helicopter sound effects into the second shot's audio track. Since shot 2 is a little longer than the helicopter shot, you might have to paste it two or three times. A neat trick you can use to convey how much louder it is inside the helicopter than on the ground is to bump up the volume in the second shot. Just move up the ends of the red horizontal line that passes though the audio track. If you don't see the red line going through the middle of the audio track, make sure the audio track arrows are pointing down.



STEP 9

Bringing in a soundtrack

Music is very important in setting the appropriate scene in a good movie. To see how music affects our tutorial, open the SPIDERED.WAV file and drag it to Audio 3 on the timeline. You can listen to the music by scrubbing in the ruler at the top of the Timeline window. If the music comes in too late, you can lop the opening off using the razor blade tool. You can also raise or lower the volume the same way we did in Step 8. If you run out of music before the end of the sketch, you can copy the track and paste it in again right next to the original.

STEP 10

Putting it all together

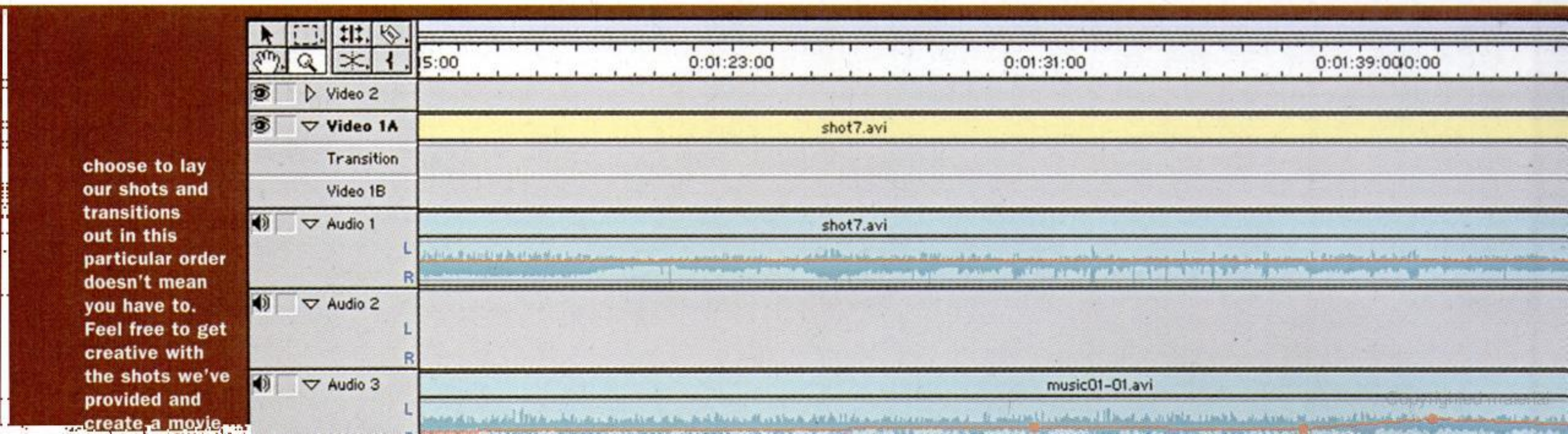
From here, the rest of the editing process is cake. Just bring in each of the shots in order and alternate them between the Video 1A and Video 1B tracks. Drop transitions between each clip to ease from one shot to the other. We used cross fades in our movie, but you can experiment with any transition you like. We provided an example timeline below that you can follow to place shots and transitions, or you can go off on your own and just experiment with the shots we've provided. Have a good time.

STEP 11

Tread lightly

Unfortunately, after you create your movie using the *Premiere* demo, you can't save your work, so tread carefully within the application. If you crash, you have to start over. After

choose to lay our shots and transitions out in this particular order doesn't mean you have to. Feel free to get creative with the shots we've provided and create a movie



you've laid everything out on the timeline—you have the music at the proper levels and the transitions in place—drag the sky blue render line (the one that's between the ruler and the top of the Timeline window) to the end of the clip and hit return. *Premiere* will do you a quick render of the entire project and play it out for you in the Monitor window. Congratulations, you're now a real movie editor!

STEP 12

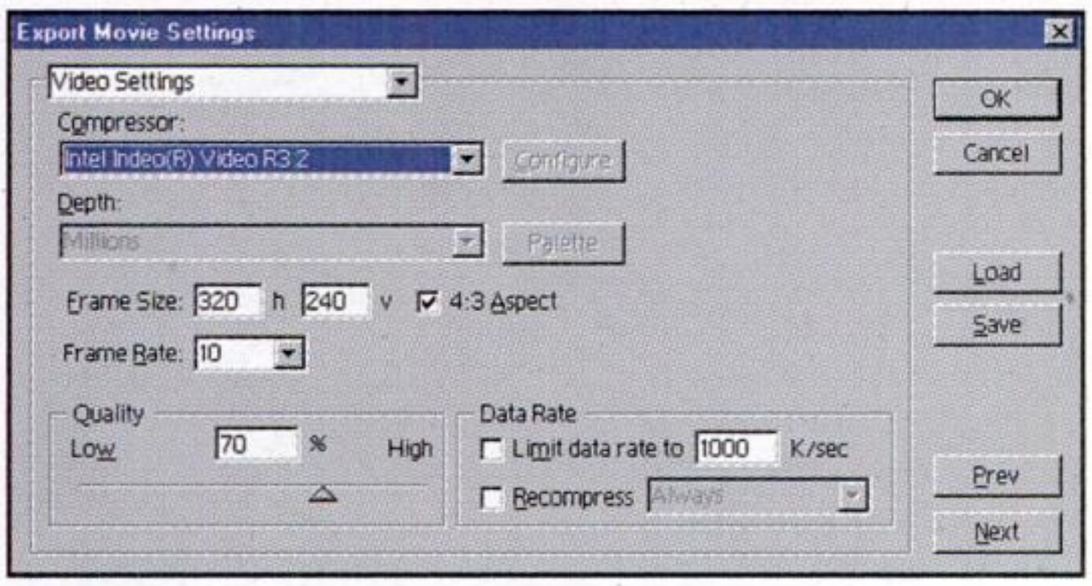
Rendering out your project

Although you can't do it with the demo version of *Premiere*, rendering out your final project is the all-important step that makes a masterpiece out of all your movie bits. To render your movie, go to file/export/movie. The first screen lets you choose whether you want to save as a QuickTime or AVI. For our tests, we left it at AVI. Hitting the Next button takes you to the compression algorithm screen. *Premiere* comes with many, and it will take some trial and error before you find a solution that suits you best.

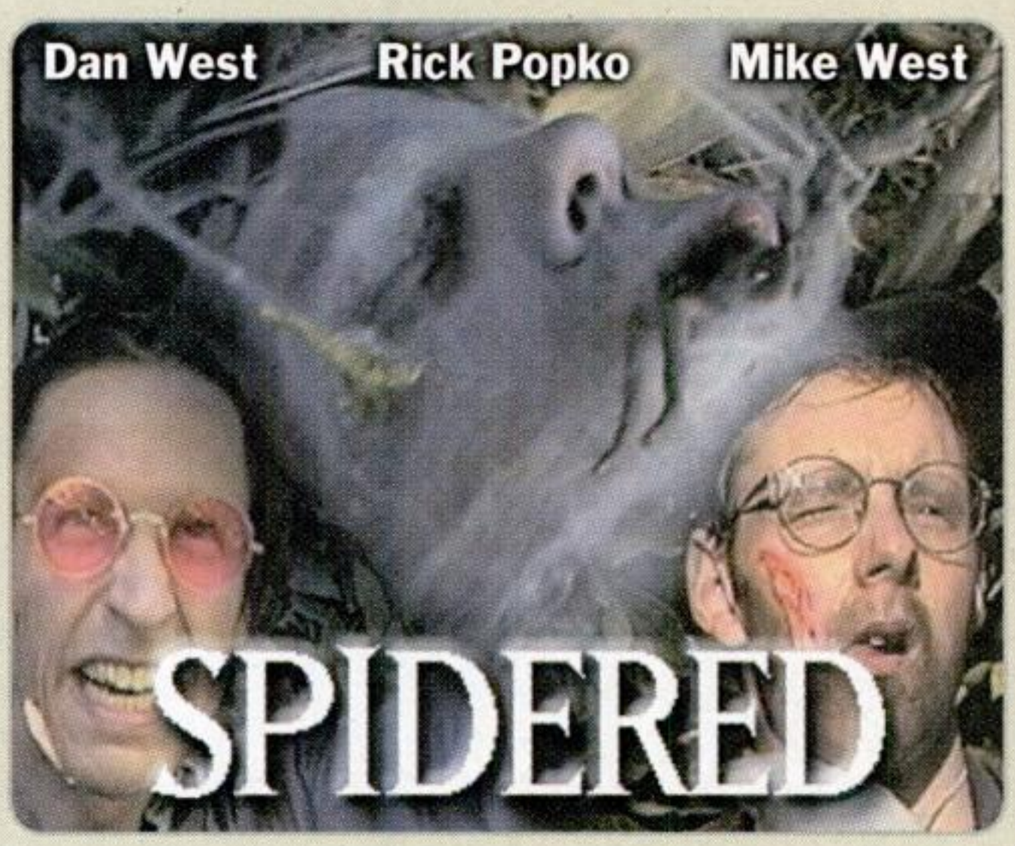
Because our project's eventual destination was CD-ROM, we needed a compression codec that would shrink our video to a manageable size. To give you an idea of the magnitude of compression involved in the CD-ROM version, the original full screen (720x480) 30 frame per second movie weighed in at 450MB. The final compressed version came in at about 32MB.

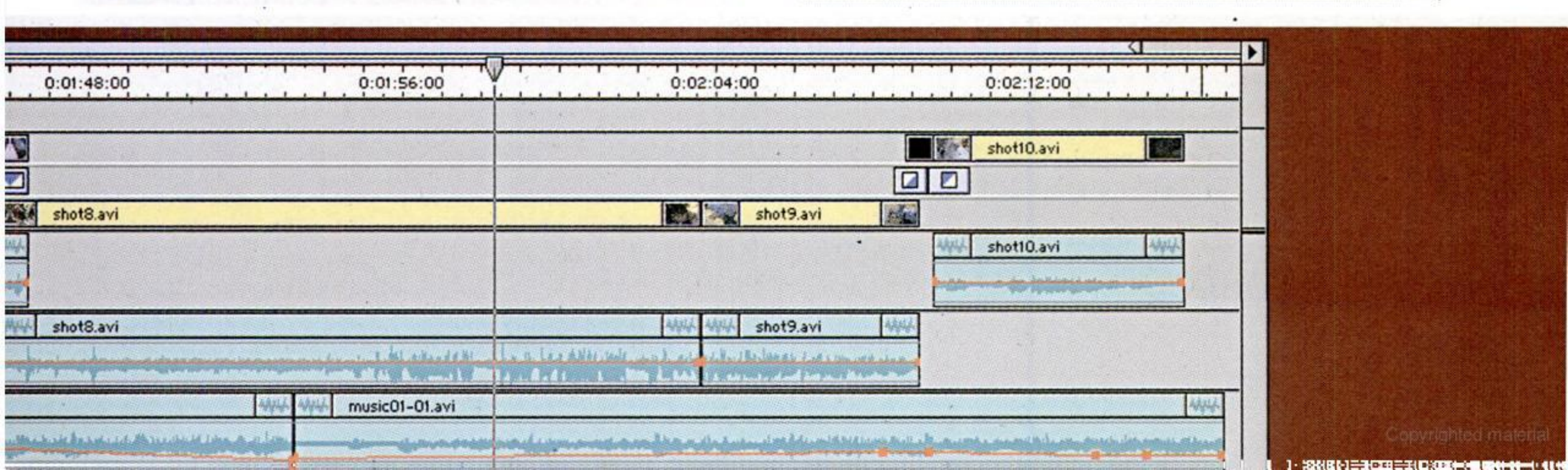
We used the Indeo algorithm to work our compression magic and set the target resolution to 320x240. The Quality slider also helps in crunching video by allowing you to tweak the final picture quality—lower quality means lower data rates. For our audio settings we chose 22kHz 8-bit stereo to keep the file size small. Audiophiles can crank it up to 48kHz, and AM radio fans can turn it down to 5kHz (though we don't recommend you go this low unless you have to send an audio file over the Internet). Leave everything else on the screen at its default setting, name your movie, and let it render.

Now that you've learned the basics of software video editing, it's time to get creative and do something with those old videos.



As an added bonus, *Premiere* also includes a frame grabber that will grab the current frame in the monitor window and save it as a BMP. Go to File/Export frame and give your picture a name. We took three stills from the video, brought them into *Photoshop*, and created this cool movie poster.





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Inside the bootLab

The bootBoyz show you where it all takes place

HOW TO BENCHMARK A WILD CPU

When a CPU manufacturer slides us a new processor right off the cookie sheet, we have to devise a testing strategy that cuts to the heart of the new silicon's enhancements. This can be problematic when the manufacturer isn't simply adding cache or increasing clock speed, but rather introducing a whole new set of instructions. Case-in-point: When Intel gave us a Pentium III in mid-January for benchmarking, we had trouble determining the best way to test the sucker's newfangled Streaming SIMD Extensions (SSE). The 70 new instructions only kick in with optimized videocard drivers or application code, and when we first received the CPU, no optimized applications were available. So we turned to optimized nVidia TNT drivers for some evidence—any evidence—of the new extensions' utility. The game plan: Run our regular, nonoptimized gaming benchmarks under optimized drivers and note whether anything exciting happens. Our experience with AMD's 3DNow! told us that mere driver enhancements can work wonders for nonoptimized game code.

If you read last month's issue, you already know we didn't see any wild jumps in framerates when running regular games under SSE-optimized drivers. Yet 3DNow!-optimized drivers helped AMD's K6-2 realize framerate improvements close to 100%. So what went wrong? Here's two hypotheses: 1) Our videocard was bottlenecking the front-end of the 3D rendering pipeline, keeping framerates under a ceiling and making any SSE performance boosts irrelevant. 2) The benchmark itself (*Forsaken*) didn't need any floating-point assistance; sheer Intel clock speed was enough to drive polygon setup and lighting, so SIMD turbo-charging was unnecessary.

But how do we mitigate the fact that SIMD floating-point did so much for *Quake II* running on 3DNow!-optimized drivers? Here's the conventional wisdom: AMD's "regular" floating-point performance is so insufficient, *Quake II* truly needs SIMD floating-point assistance—and when AMD optimized 3Dfx's OpenGL drivers, it did so with *Quake II* in mind, so the game could really sink its teeth into the CPU's silicon. Meanwhile, in our Pentium III *Forsaken* test, we threw a relatively undemanding game at an already well-powered floating-point engine—hence no extra SIMD assistance was necessary and we saw no significant framerate improvements.

So what about software that's been written to SSE from the ground up? A few days after we completed our *Forsaken* tests, Intel sent us benchmarks that hooked into SSE versions of real-world applications—software that wasn't yet available on the open market. Each benchmark fired up an application, ran it through a processing script, and then spit out a time mark.

We ran these benchmarks on both a 450MHz P-II and a 450MHz P-III, and found that the P-III's SSE instructions offered phenomenal performance gains. But were the benchmarks valid? We're confident that indeed they were, albeit with a caveat. The benchmarks were furnished by Intel, but were based on code written by independent software vendors; Intel simply supplied the documents to be processed and defined the processing scripts. One has to assume that, whenever possible, Intel fashioned processing scripts that made frequent if not continuous use of SSE instructions.

We used three application benchmarks in last month's Pentium III testing. The Microsoft *NetShow Encoder* and Dragon *NaturallySpeaking* tests were relatively simple in construction: Each performed a single, "application-defining" operation on a single document. Namely, *NetShow* encoded a video file and *NaturallySpeaking* converted a WAV file into written text. Logic tells us that the simplicity and purity of these tests precluded any opportunity for Intel to build a processing script that heavily favored SSE.

Our third benchmark, *Photoshop*, afforded Intel a better opportunity for tinkering. *Photoshop* is a mathematically diverse application. That is, different operations within the program—from converting a color palette to applying a wind filter—use different calculations that demand attention from different parts of the processor and its cache. It's therefore entirely possible (and expected) that Intel would build a *Photoshop* processing script that made calls to SSE as often as possible. And, in fact, we saw the greatest performance boosts in the *Photoshop* benchmark. You might see much less significant boosts if your own *Photoshop* activity doesn't require as many SSE calls.

We think we tested the Pentium III as objectively as possible within the limitations thrown at us. The next step is to get public SSE-optimized applications and devise our own processing scripts. Keep reading—the jury's still out on SSE.

—Jon Phillips

While Jon wrestles this CPU to the ground and tags its ear, we'll tell you about a new Mutual of Omaha homeowner's policy.

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Olympus D-620L

Don't call it a comeback. In fact, don't call the D-620L a breakthrough either. The latest from Olympus is really a minor bugfix for the company's 1997 Kick Ass D-600L camera. The 1.4 megapixel CCD delivers the same 1280x1024 images, and the seven-element TTL 3x zoom lens is still the best in its class. What's new? An external flash sync (to keep up with the Kodaks). And additional buffer memory boasts burst shooting in the ballpark of 3fps. But one of the most important fixes addresses the D-600L's Achilles' heel—power consumption. Four NiMH batteries are included in the box this time out, as well as an "intelligent" battery recharger. The camera also has a new battery-saving mode. A significant res boost and reinforced body design (as well as a switch to the much more roomy CompactFlash removable media) might have kept this year's model at the head of the pack. Still, the year's young and Olympus should have more up its sleeve. **Olympus; www.olympus.com; 800.347.4027**

A 33.6K modem comes with the Japanese model, but the U.S. version should come with a 56K modem.

Although the controller reeks of Nintendo 64-ism, the cool PDA makes for some unique possibilities. It not only holds saved games, but also stores interactive game data and imports it back into the Dreamcast.

Sega Dreamcast

Say hello to the next-generation console that promises to bring 60fps arcade action into your living room. Sega marries a Hitachi 128-bit RISC processor operating at 200MHz to NEC's PowerVR Second Generation chip for a one-two combo that may just knock Nintendo out of the ring. Throw next-gen 3D features into texture-mapped polygon games such as *Virtua Fighter 3tb*, *Godzilla Generations*, and *Sonic Adventure*, and you have a console named Dreamcast.

Believe it or else, the Dreamcast runs a modified version of Windows CE, making this the first home console that could require service packs. Another interesting feature is the proprietary CD-ROM drive that holds more data than a standard 650MB CD-ROM—making it all the more difficult for software pirates to duplicate.

While Dreamcast was launched in Japan last November, all you wide-eyed gaijin will have to either buy a Japanese machine for about $500 (and be stuck with buying imported games) or wait until the console's November U.S. release date. We can only hope it launches here with better titles than it did in Japan. **Sega; www.sega.com; 800.872.7342**

Konexx AutoSet

How many times have you found yourself in a hotel or office building with only digital PBX phone lines? Until now, you've been trapped with no line out in an increasingly digital world. Konexx's $199 AutoSet sets you free by tapping digital phone lines so you can dial out with your analog modem or fax machine. The AutoSet connects to a phone's handset jack and uses an advanced DSP to adapt to most PBX systems, connecting at speeds up to 33.6Kbps. Designed for mobile warriors, the AutoSet runs on a pair of 9-volt batteries. It may not look like much, but the AutoSet could be the only thing that will free you from your telecom department's unwillingness to install analog lines. **Konexx; www.konexx.com; 800.275.6354**

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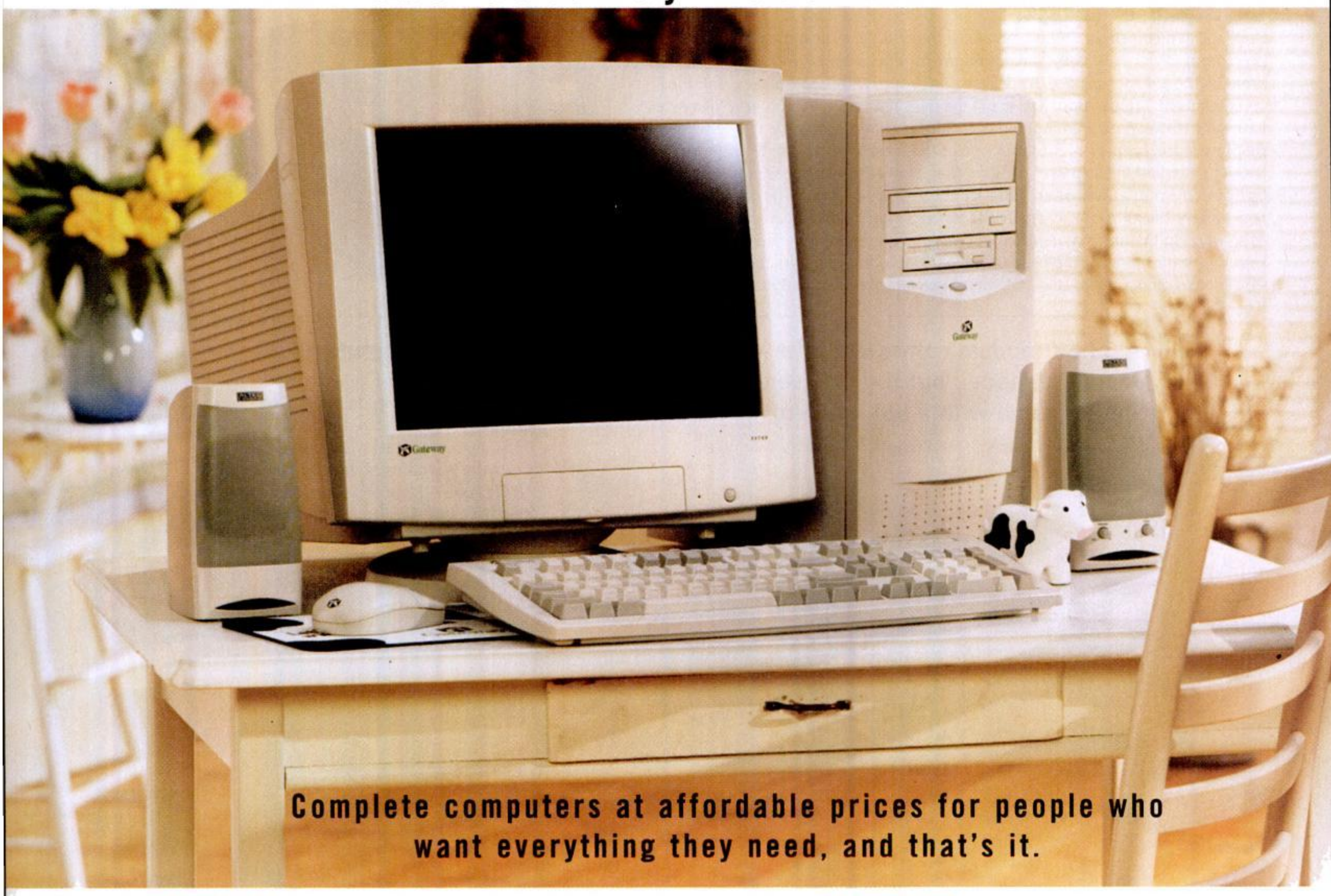

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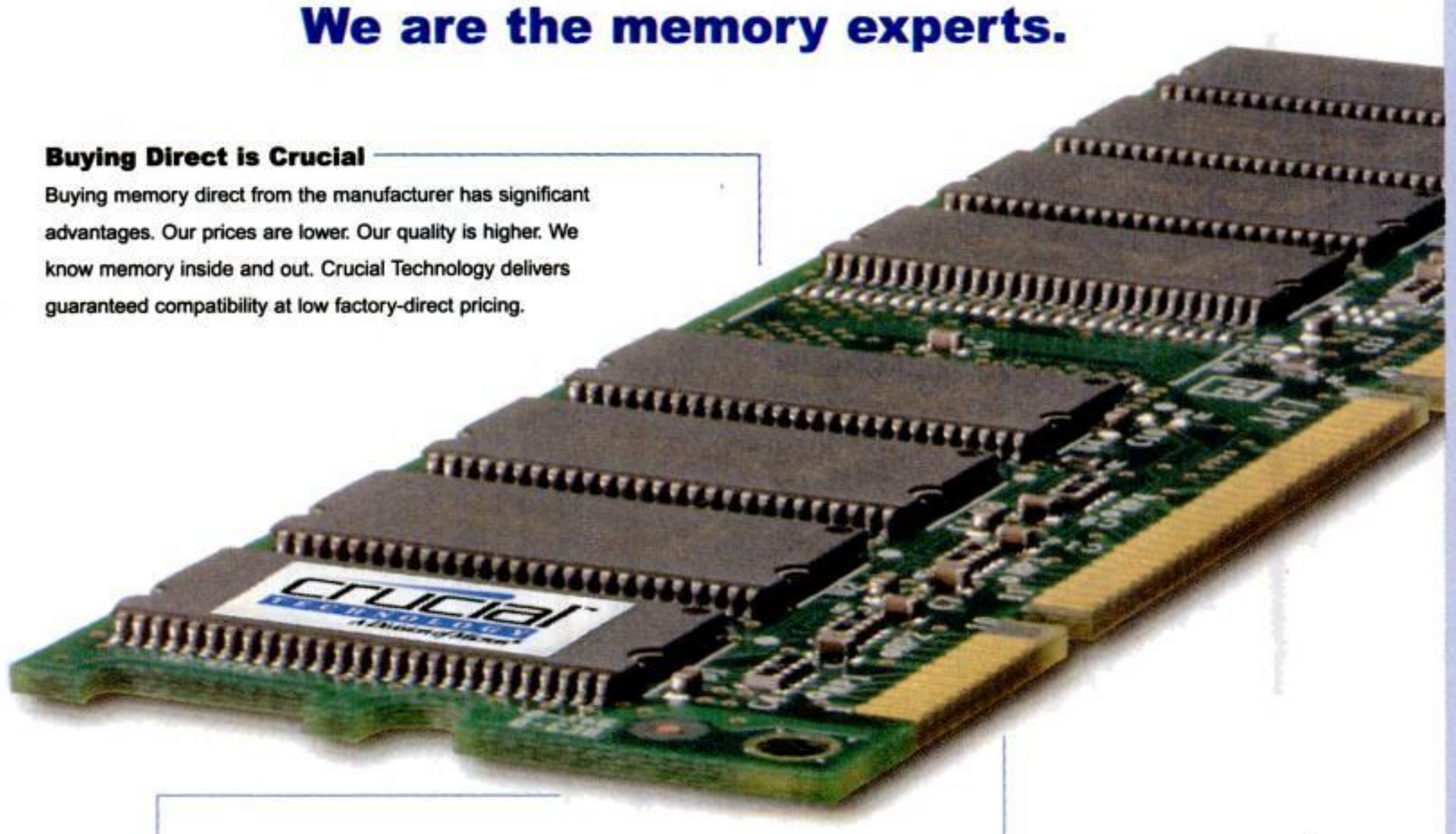

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FAST FORWARD

Information Liberation Front

XML IS THE KEY TO FREEING YOUR IMPRISONED DATA

"Information wants to be free," says industry pundit John Perry Barlow. It's a cleverly disguised aphorism, because information doesn't really *want* anything. Information is just data. It doesn't want to be free any more than it wants to eat ice cream or date Drew Barrymore.

Here's what he really means: "Some people want some information to be free." I'm sure even Mr. Barlow has some information he'd rather keep private or use to earn a living. Nevertheless, I agree with the spirit of his statement. That's one reason I like computers: They exist to store, manipulate, and distribute information in all its wonderful forms.

Unfortunately, the people who design computers haven't always been kind to our information. They imprison it within proprietary file formats. They chain it to specific computer platforms. And they deliberately make it difficult to translate our data from one form into another.

Enter XML (eXtensible Markup Language). My colleague Shel Kimen has already described the advantages of XML over HTML for web development ("XML: The Amazing Wonder Spec," November 1998). She's right on target. But to me, XML holds even greater promise: The liberation of information from the gulags of proprietary files and platforms.

Has anyone ever given you a Microsoft *Word* file you can't read? It's a common problem because there's really no such thing as a Microsoft *Word* file. Microsoft keeps changing the file format, and a new version seems to come along every year or so. This wreaks all kinds of havoc, especially at large companies that don't upgrade every copy of *Word* on every employee's desktop at the same instant in time.

I'm picking on *Word* because it's popular, but practically all other programs are the same. They imprison the data—data that you or someone else create and own—in an obscure, proprietary format that's difficult or impossible to read without a certain version of a certain program on a certain platform.

It's bad enough that storage devices and media become obsolete, but now we have to archive the old software, too, just to read the old files. And what if the old software won't run on the latest computers?

XML can liberate us from this oppression by standardizing file formats in a readable, documented fashion. The information you create or manipulate today will still be usable in the future. XML does this simply by identifying the data with HTML-like tags that both humans and machines can readily interpret. Unlike HTML, however, XML doesn't merely specify how the data should appear on a screen. Instead of tags such as <B> or <I> that merely indicate the following text should appear in boldface or italics, XML describes the data with tags such as <Name> or <ZIPcode> or <ColorPalette>.

Those tags are arbitrary because XML is extensible. Anybody can define their own tags—another key difference from HTML. XML is actually a metalanguage for designing new markup languages.

Won't that return us to the same old anarchy of proprietary file formats? Not necessarily. XML provides a standardized way to document new tags in a file called a Document Type Definition (DTD). An XML file can contain a reference to its DTD, and the DTD can reside in the same place as the XML file or at any URL on the Internet. This allows a group of people or companies to standardize on a set of tags for some special purpose. Examples include Genealogical Markup Language (GedML), Mathematical Markup Language (MathML), and Chemical Markup Language (CML).

With GedML, for instance, any XML-compatible program on any platform can manipulate the data in a family tree. More important, because XML is a worldwide standard, you can exchange those files with anybody and be confident the files will remain readable.

In effect, XML enables platform-independent data, just as Java enables platform-independent software. When combined with TCP/IP—platform-independent networking—we have all the weapons we need to free us from the tyranny of proprietary "standards" that really aren't standards at all.

Of course, there's nothing to stop programs from continuing to use proprietary file formats, right? Nothing except public pressure. As the advantages of information liberation become more clear, it will be more difficult for software companies to defend their arcane formats.

It's significant that so far XML doesn't have a powerful archenemy, as Java has in Microsoft. The folks in Redmond appear to be wholeheartedly embracing XML. Microsoft says *Office 2000* will use XML as a native file format with public DTDs. Windows 98 already uses a proposed XML standard that defines how web sites should "push" data to desktops.

Computers are here to stay. It's about time our data became durable, too. ✹

TOM HALFHILL
was senior editor at Byte magazine and is regarded as one of the most knowledgeable experts on processor technology in the industry. Contact him at **thalfhill@maximumpc.com**.

Practically all programs imprison your data in an obscure, proprietary format that's impossible to read without a certain version of a certain program on a certain platform.

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ON THE LINE

Blame it on Rio

MP3 TECHNOLOGY THREATENS TO DESTROY CAPITALISM

Imagine Godzilla; big, loud, and smelling like stale seaweed. Now picture a city full of citizens, happily building a community based on sharing. And now imagine Godzilla attacking the happy peaceful city, ripping it to shreds—all the while telling the people he's squishing that it's in everyone's best interest.

In this little morality play, Godzilla is the Recording Industry Association of America (RIAA) and the happy city represents all of us citizens who participate in the exchange of culture online. And Godzilla's latest entrée is online music distribution.

Since 1997, the Internet community has embraced a compression standard called MP3 for distribution of audio files. By mid 1998, web sites touting thousands of MP3 titles, from commercial and noncommercial artists, were commonplace. Diamond Multimedia released the Rio (a Walkman-esque device for transporting MP3 files). And in January, MP3.com landed $11 million from Sequoia Capital.

Godzilla vs. MP3 Part 1

Last October, under the strong arm of the RIAA, an injunction was issued against Diamond Multimedia to block the sale of the Rio player. The action claimed Rio technology violated the 1992 Audio Home Recording Act (www.riaa.com/musicleg/mlgloss.htm#ahra) requiring digital recording devices to encode a serial-copy-management system.

In other words: People might get music for free and capitalism would fall. Yikes!

"If people can get music for free and take it away in the form of a Rio-type recorder, how can a legitimate commercial market emerge?..." pleaded Cary Sherman, senior executive vice president and general counsel for the RIAA.

Godzilla vs. MP3 Part 2

On December 16th, the RIAA launched a second attack with the announcement of its own standard, the Secure Digital Music Initiative (SDMI). Ironically (and somewhat tragically), former MP3 proponents such as RealNetworks and Diamond Multimedia chose to follow the money and publicly endorsed the initiative. Tech companies support the initiative because it allows them to leverage the entertainment industry, which everyone knows bleeds cash.

According to its web site, the RIAA represents more than 500 companies that "create, manufacture, and/or distribute approximately 90% of all *legitimate* sound recordings produced and sold in the United States." But what exactly is "legitimate" music? And who should control that definition? What about independent artists not pumping out pop drivel for the mighty dollar? And why throw away years of development and millions of dollars to build a new standard, when we could address the concerns with an existing one?

The answer is simple. Greedy record executives want a tight grip on copyright control, and the only way to do this is to build a system from scratch, make it ubiquitous, and dominate the market. The music-loving masses have long pleaded with the record labels to devise a digital method of distribution. Such a system would eliminate out-of-stock limitations, allow instant-gratification purchases, and cut costs by eliminating material, manufacturing, shipping, and inventory expenses. But the industry contently sat on its hands... until MP3 came along.

RIAA members faintly assure us that *no* digital distribution method could ever bring down costs, in attempts to discredit the claims that MP3 technology would yield greater profit for artists and labels, *without* copyright control.

According to a *New York Times* article, Strauss Zelnick (chief executive of BMG Entertainment) said, "The cost of a CD is related to the creative effort that goes into making the music, which is a lot more than the plastic that goes into a disc... What's driving the costs is rewarding the artists for their creativity."

That's just not true.

About $2 of a $15 CD goes to artist royalties (split between artists and their managers and producers), $5.50 goes toward manufacturing and distribution, and the rest goes to labels and retailers, according to Forrester Research.

Godzilla vs. MP3 Part 3

As if that weren't enough... The following announcement appeared February 1st on the RIAA web site:

"We have communicated with Lycos about their new MP3 search engine, and they have committed to work with us to develop procedures to eliminate infringing sites from their directory. They also indicated their intent to fulfill their obligations under the newly enacted Digital Millennium Copyright Act, which requires them to take appropriate action whenever they become aware of an infringing musical recording."

Digital Millennium Copyright Act? Uh oh. That sounds like Big (green) Brother knocking on the door of our happy city.

If you value your freedom of choice, if you value diversity of culture, if you're tired of being exploited, support copyright-free music.

Former MP3 proponents such as RealNetworks and Diamond Multimedia chose to follow the money and leverage the entertainment industry, which everyone knows bleeds cash.

SHEL KIMEN
has worked in the industry, traveled the world, and covered the Internet for both The Net and boot magazine. She can be contacted at **skimen@maximumpc.com**.

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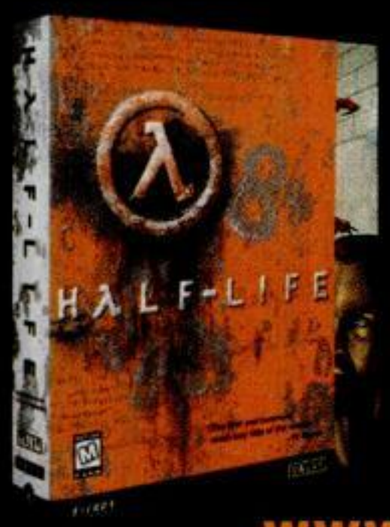

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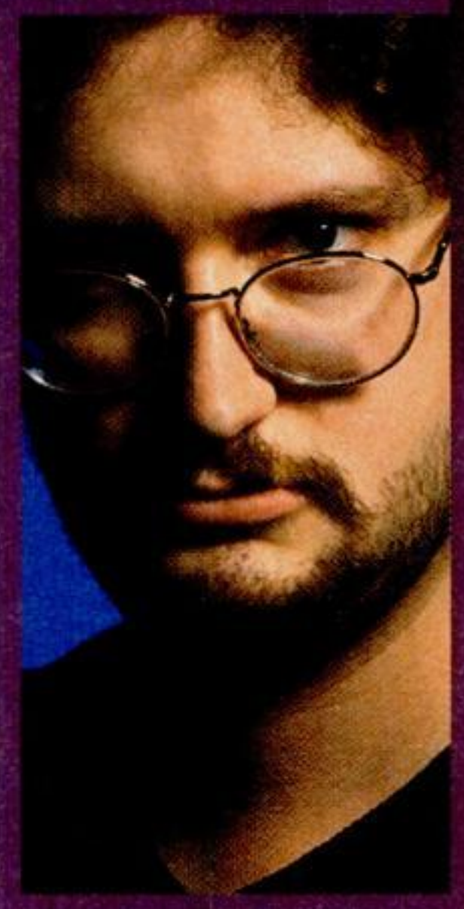

T. LIAM MCDONALD
is a veteran of PC Gamer magazine and is much bigger than he looks in this picture, so keep that in mind before writing him any hate mail at **tmcdonald@maximumpc.com**.

WaReZ the Logic?

HACKERS ARE PUSHING GAMING COMPANIES INTO EXTINCTION

This will come as a shock to the smart, honest, and hygienic readers of *Maximum PC*, but there are actually people out there *who steal software*. The strange part is that most of them would not consider walking into an Electronics Boutique and shoving a copy of *Rainbow Six* under their shirt, but don't have the slightest qualms about downloading ripped software from the web, which is the exact same behavior. That they are unable to perceive these behaviors as equally dishonest is a result of the ethically murky landscape of Internet culture.

Too many gamers see nothing wrong with downloading "warez" (usually pronounced "wares," but also "wah-rez"), retail software products that have been "ripped" to make them smaller and remove copy protection. Like most things in hacker culture, warez are largely created and traded not to avoid paying for the software, but just for the sake of doing it. The warez is a trophy, and the game itself is often barely or never played.

This smacks of the kind of specious rationalization hackers fall back on when they're doing something clearly wrong. But let's just accept their explanation for the moment and concede that this was just an "elite" (their term) and limited circle of traders. That justification goes right out the window the minute the warez hits the web, FTP site, or Usenet, which it does the minute after the warez is created. Now, any schmuck with a modem and a lot of time and patience (*you* try downloading *Half-Life* at 38Kbps) can pull the latest games off the web without ever paying for them.

The most galling notion of all is that somehow these warez geeks see themselves as Robin Hood–type figures, stealing from the fat-cat companies to give to the poor gamers. But they aren't stealing food or medicine; they're stealing a completely superfluous luxury product created at great expense. This fact never enters their irony-proof little brains. One quick trip through any warez site will give you a vivid picture of just what kind of bottom dwellers these characters are. One guy who runs a warez site was boasting about how he just got promoted to Assistant Manager at McDonalds. He also bought not one, but *two* Packard Bells, which says volumes about the quality of this self-selecting "elite."

They also talk in a juvenile lingo known as "leet-speek" (or l33t sp33k). As in "h3Y, D00Dz, i aM 3l33t! GiVe mE WaReZ!" Any closed culture will try to create its own lingo, but does anyone think this holdover from BBS days is even a tiny bit cool? The minute you see it, the "loser alert" goes off.

Far too many people think it's fine to "stick it to the man" this way. Hey, it's just a game. No one's getting hurt. They won't even miss the sale. It's just more self-justification. (Hint: if you have to explain your actions to yourself, they're probably wrong.) The situation isn't necessarily helped by the fact that the people fighting warez, such as the Software Publishers Association and the Business Software Alliance, make inflated claims about the damage downloaded software does to the industry. They lump it in with figures from commercial piracy to arrive at an $11 billion loss to the industry every year. Clearly, that's assuming everyone who downloads software would have bought it at retail, which is obviously not the case. A fair number of people who download a game probably wouldn't have bought it. The issue is more subtle and complex than that.

People who trade in warez don't make money from it, so they see nothing wrong with their actions. The fact that Congress passed a bill last year making copyright infringement a federal offense even in the absence of any monetary profit would probably not deter them even if they did know about it. With modem connections as slow as they are right now, downloading huge pieces of software simply isn't all that practical, which means the damage to the industry is currently minimal. This damage will become catastrophic as more people get high-speed connections.

If the culture of warez is left unchecked, more and more people with the ability to download large files will think nothing of "shopping" for their games via warez sites. Since the game companies themselves have done little to inspire goodwill in their customers, normally honest people will become conditioned to think of downloading ripped games as OK. As sales swirl down the Internet toilet, so will companies, and there won't be any more games for the warez weenies to trade. It's like clear-cutting Amazon forests: you have lumber and farmland for a while, but pretty soon you have no breathable air. It's deliberate, willful self-extinction, and in computer gaming, the warez weenies are leading the way over the cliff. ✹

The most galling notion of all is that somehow these warez geeks see themselves as Robin Hood–type figures, stealing from the fat-cat companies to give to the poor gamers.

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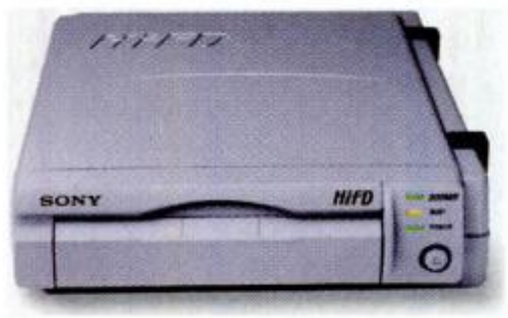

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PURE

"I've seen cases where people have gone way over the top and cooked boards, sped-up the clocks, cooked drivers, and stuff like that just to come out on top in the benchmarks. That's totally wrong."

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DYNAMITE

Dan Vivoli of nVidia has the company's next-gen 3D card—TNT2—wired and ready to explode. And he's threatening to take 3Dfx hostage in the ensuing fray.

Maximum PC nVidia has had a checkered history. You've gone from bad (NV1) to not-so-bad (Riva 128) to really good (TNT). How did you make such a dramatic transition?

Vivoli Well, I wouldn't say our technologies have changed. First, we realized we needed to focus on standard APIs—OpenGL and D3D. Given that the APIs have evolved, I'll admit the Riva 128 and Riva TNT are dramatically different architectures with dramatically different feature sets, but we built them both to be the most powerful graphics accelerators, given the state of current standard APIs at the time they came out.

Maximum PC Surely you can't blame APIs for the Riva 128's visual defects?

Vivoli No. With Riva 128, we were admittedly more focused on performance than quality, although I do believe we got a harsher rap than we should have.

Maximum PC Since visual quality is purely subjective, right?

Vivoli Absolutely! And there were a lot of cases where it was totally overdone. We live in the Internet world, where it's really easy to blow things out of proportion. It was hip at the time to talk about the poor quality on the Riva 128. I just don't think it was as big a deal as was made of it. Having said that, we did make a conscious effort with TNT to step up our visual quality, as well as the performance.

Maximum PC TNT is stepping aside to make room for TNT2. What's changing?

Vivoli TNT's .25-micron process allows us to run at much higher frequencies. TNT currently ships between 90MHz and 110MHz. TNT2 will have somewhere between 25% and 50% faster clock frequency. Heck, it could even be twice as fast! We've also made some driver enhancements. We have a driver release called "Detonator" that in and of itself gives TNT a boost. Combine that with TNT2 and you get a huge performance increase over the original TNT.

Maximum PC We've heard that before. Can you give us a hard number?

Vivoli To be conservative, I'd say 60%. We also increased the frame-buffer size from 16MB up to 32MB, and we built in a digital flat panel interface. We made some enhancements here and there in the architecture that clock-for-clock make it 5% to 10% faster than a TNT.

PROFILE

And he would be...?

Dan Vivoli is nVidia's vice president of product marketing, but don't let his title fool you. This guy actually knows his stuff. Maybe his stint at SGI taught him a thing or two.

And I would know him from...?

nVidia's made a name for itself when the company introduced its RIVA 128 chipset. Sure, that chip had flaws, but the follow-up TNT chip didn't, and wowed gamers across the globe. Next up, TNT2.

And I would care because...?

nVidia has some of the hottest 3D technology on the planet. And with TNT2 coming down the pike and the NV10 to be delivered sometime later this year, 3D as we know it is getting ready to explode.

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Maximum PC How come it took nVidia nine months to release optimized drivers for the K6-2?

Vivoli We wanted to make sure we had a good, stable, quality release for the mass market first. Did we integrate 3DNow!? No, but we did add it into our Detonator driver release. Still, in many games, we had better AMD performance than anybody else. With TNT's first release, there wasn't any reason to focus resources away from what we thought was most important.

Maximum PC But there's been a lot of talk from users having problems running TNT boards on Super 7 motherboards. Did TNT require too much power to run correctly?

Vivoli No. TNT is fully within the specifications defined by the Socket 7 and Intel architectures. But it's also a big chip and the first of a new generation of chips that draw a lot of power and current. Some chipset vendors, particularly the low-cost vendors, didn't adhere to the specs. The chipsets were drawing more than the specified power just because there was enough to go around, and up to that point, graphics engines weren't using their allotted power. It's a big bucket, but if someone uses more than their fair share, things don't work.

Maximum PC Who should shoulder the responsibility to make sure everything works according to spec?

Vivoli We take responsibility to make sure *our* part works, and when these problems happened, we worked with the chipset vendors to find a solution, but there's no way for us to test every single chipset ever built—it's just impossible.

Maximum PC Can we expect similar problems with TNT2?

Vivoli Actually no. TNT2 will draw less current than TNT. It's a smaller chip and a denser technology.

Maximum PC Rendition's much-vaunted Socket X graphics chip standard: Dead or alive?

Vivoli I haven't seen any signs of life yet! Oh, we've had discussions with Rendition and Micron, but frankly, I just don't see what the benefit is. They're trying to create a world—much like the CPU world—where an OEM could buy a chip from any vendor and swap it out for something else that was pin compatible. The problem is there are too many chips. Intel owns the CPU world; it completely controls the innovations, and the innovations are mainly just clock speed and instructions. For the most part, the pin-out doesn't change.

On the graphics side, there are a lot of different choices. There are different graphics memories, different sizes of chips, and different pin-outs. There's way too much innovation in graphics to be forced into a specific pin-out. Socket X also calls for integrated memory. We won't force ourselves down that path. If you do the economics on integrated memory, you can't put a very big frame buffer on a chip, and the real estate you spend on a frame buffer might be better spent on transistors to do graphics parallelism or other functions.

Socket X inhibits us from innovating and it inhibits the user or the OEM from being able to take advantage of that innovation. Does that make sense? No.

Maximum PC Can you make sense of 3Dfx's recent moves?

Vivoli For the most part, 3Dfx builds good products. But it's made some big mistakes in its last few products. Voodoo^3 felt like a desperate product announcement that's missing key features, such as 32-bit rendering, 24-bit z-buffer, and stencil buffering, to name a few. And 3Dfx announced it earlier than they had to, probably because they realized Banshee wasn't going to be the product they hoped it would be. Given that, they didn't have anything to lose by announcing a product that wasn't shipping yet.

Further, I'm surprised that 3Dfx chose the name "Voodoo" for its new product. I always thought Voodoo meant "state-of-the-art, best/most feature-filled product." If Voodoo^3 is the most feature-filled, state-of-the-art product 3Dfx has, that bodes well for us.

Maximum PC nVidia has been plagued by lawsuits during the past year or so. Does this stifle competition?

Vivoli When industries begin to mature, companies jockey for position and shake-outs are bound to happen. When you're rocking and rolling and doing really well, your products make money for you because you build products that people want to buy. When you're on the downside and your products are really lame and you're behind the technology curve, you make your money through your lawyers. A lot of companies are in that later stage of trying to find a position in the industry that isn't necessarily based on keeping your products competitive.

We have a patent portfolio to protect ourselves, but we compete by building the best products you can buy for your PC.

Maximum PC How much money did nVidia pay Thomas Pabst of Tom's Hardware web site to endorse your product?

Vivoli We didn't pay Thomas Pabst a dime!

Maximum PC Then why does his site prominently feature nVidia's "Approved Review" logo?

Vivoli The problem with the Internet today is that you can't tell the difference between a 13-year-old kid in his bedroom from a

"I'm surprised that 3Dfx chose the name 'Voodoo' for its new product. I always thought Voodoo meant 'state-of-the-art, best/most feature-filled product'."

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legitimate, knowledgeable tester of PCs. Frequently, the person doing the testing doesn't know what they're doing and comes to conclusions that are totally inaccurate. This misleads consumers trying to figure out what's actually going on.

The idea was for him to go around and get different chip vendors to say, "Hey, we've looked at Tom's methods and agree with his methods." We just happened to be the first company to do that. The mistake we made is we should have formed some sort of agreement with the other card companies, some kind of a Good Housekeeping approval. We'd be much happier if his site had logos from ATI, 3Dfx, and all the other graphics players. The problem, of course, is whenever you involve your competitors, politics rears its ugly head.

Unfortunately, this plan has backfired. People have this impression that we somehow cut a deal with Tom to say good things about our hardware, but this isn't the case at all. The goal wasn't to make him look like a sell-out. We may not necessarily agree with his results, mind you, just his methods. We'd do that for any web site that we approved of, *Maximum PC*'s included.

have to deal with is sometimes we don't have a shipping product when the review cycle comes, so we try to submit what we think is going to be as close to the final product as possible. But I've seen cases where people have gone way over the top and cooked boards, sped-up the clocks, cooked drivers, and stuff like that just to come out on top in the benchmarks. That's totally wrong.

It's a morally bad thing to do.

Maximum PC What do you think of companies that sell your chips overclocked?

Vivoli It's up to the board vendor to decide how they want to clock it and cool it. There's quite a range you can clock these things at, depending upon what kind of conditions you're operating it in. When we spec our chips, we give a range of clock frequencies, given environmental conditions. Our base spec is really conservative—zero airflow at 55 degrees C, 90MHz to 110MHz. But with different cooling methods, people can overclock it safely.

Maximum PC What realistic boundaries are there in designing a chip? What's stopping you from offering a "Holodeck" experience?

Vivoli It's the sheer number of calculations. I remember watching *Titanic* and saying, "that's cool, but the water looks fake." The special effects guys had two or three hours a frame to render those waves, with all kinds of complex logarithms, but it *still* didn't look real. If it doesn't look right, your eyes will pick it up instantly.

On the other side of it, people in games are blocky because you can only put so many polygons in a scene before you can't render polygons in realtime anymore. I was playing *Half-Life* the other day and the characters look pretty cool. Their mouths move, their bodies move, you see more definition. Relative to the last generation of games, they look a lot better; but relative to the way humans really look, it's still pretty bad.

Maximum PC So what's it going to take? Faster processors? A new architecture?

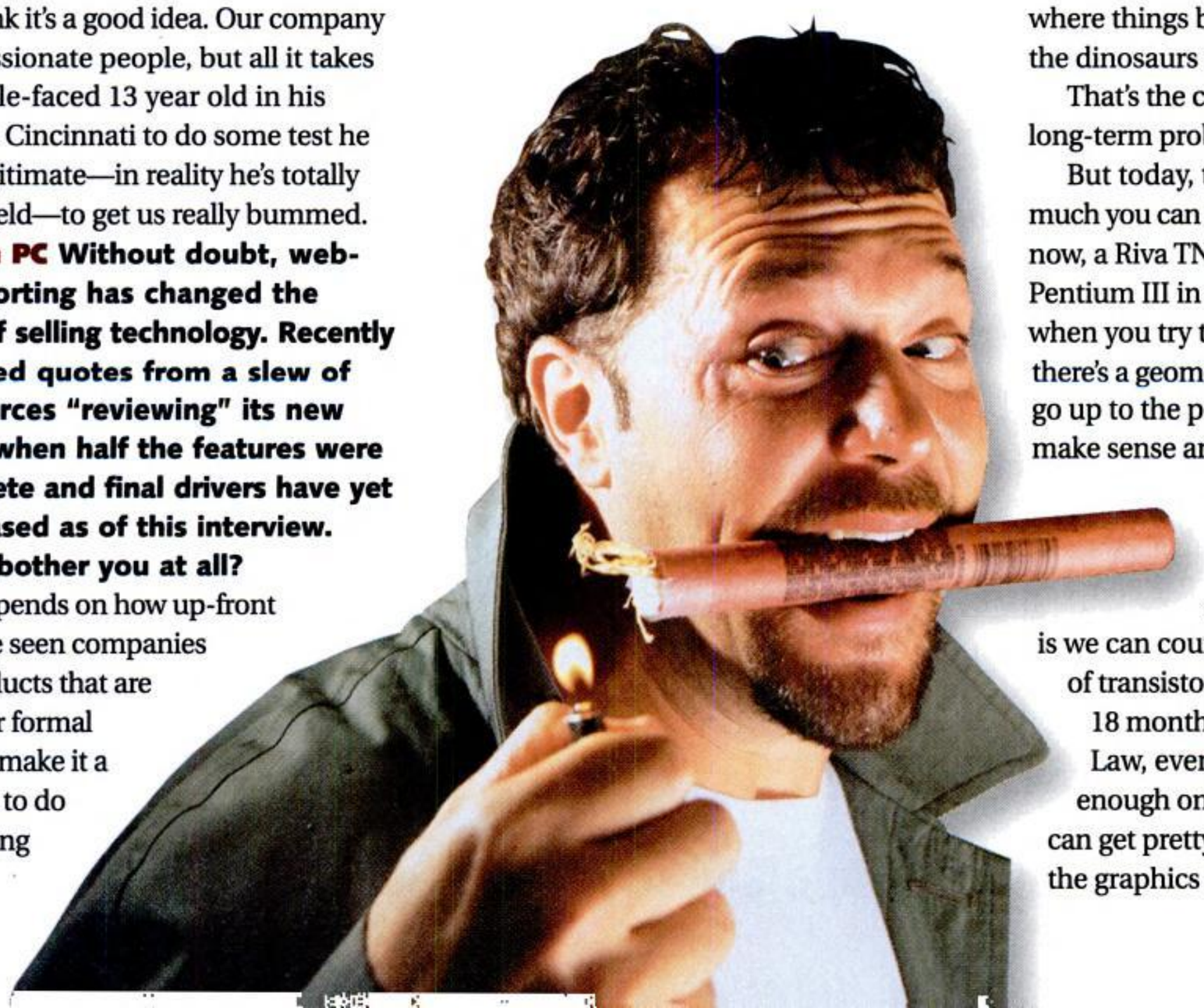
Vivoli The biggest bottleneck is in the pixel processing. When you move closer to a wall for example, you don't want the texture to get blurry—you want more detail. By our calculations we're somewhere between 10 and 20 years before we get to the point

"The problem with the Internet today is that you can't tell the difference between a 13-year-old kid in his bedroom from a legitimate, knowledgeable tester of PCs."

I still think it's a good idea. Our company is full of passionate people, but all it takes is one freckle-faced 13 year old in his bedroom in Cincinnati to do some test he thinks is legitimate—in reality he's totally out in left field—to get us really bummed.

Maximum PC Without doubt, web-based reporting has changed the business of selling technology. Recently ATI featured quotes from a slew of online sources "reviewing" its new hardware when half the features were not complete and final drivers have yet to be released as of this interview. Does that bother you at all?

Vivoli It depends on how up-front they are. I've seen companies submit products that are "cooked" for formal reviews. We make it a practice not to do that. The thing that we all



where things begin to look about as real as the dinosaurs in *Jurassic Park*.

That's the cool thing about this—it's a long-term problem, not a short-term one.

But today, there's just a limit to how much you can fit in a practical space. Right now, a Riva TNT2 is about the size of a Pentium III in transistors. At some point, when you try to build a die that's too big, there's a geometric curve where your costs go up to the point where it just doesn't make sense anymore—you don't yield enough parts and you can't sell them at a reasonable price. The great thing about semiconductor technology is we can count on doubling the amount of transistors we can put on a chip every 18 months or so. If you follow Moore's Law, eventually we'll be able to put enough on a piece of silicon where you can get pretty close to a real life built into the graphics engine.

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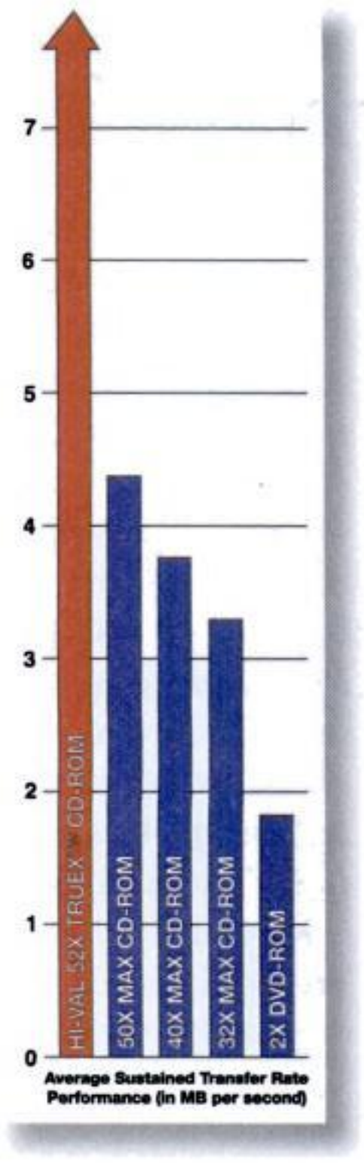

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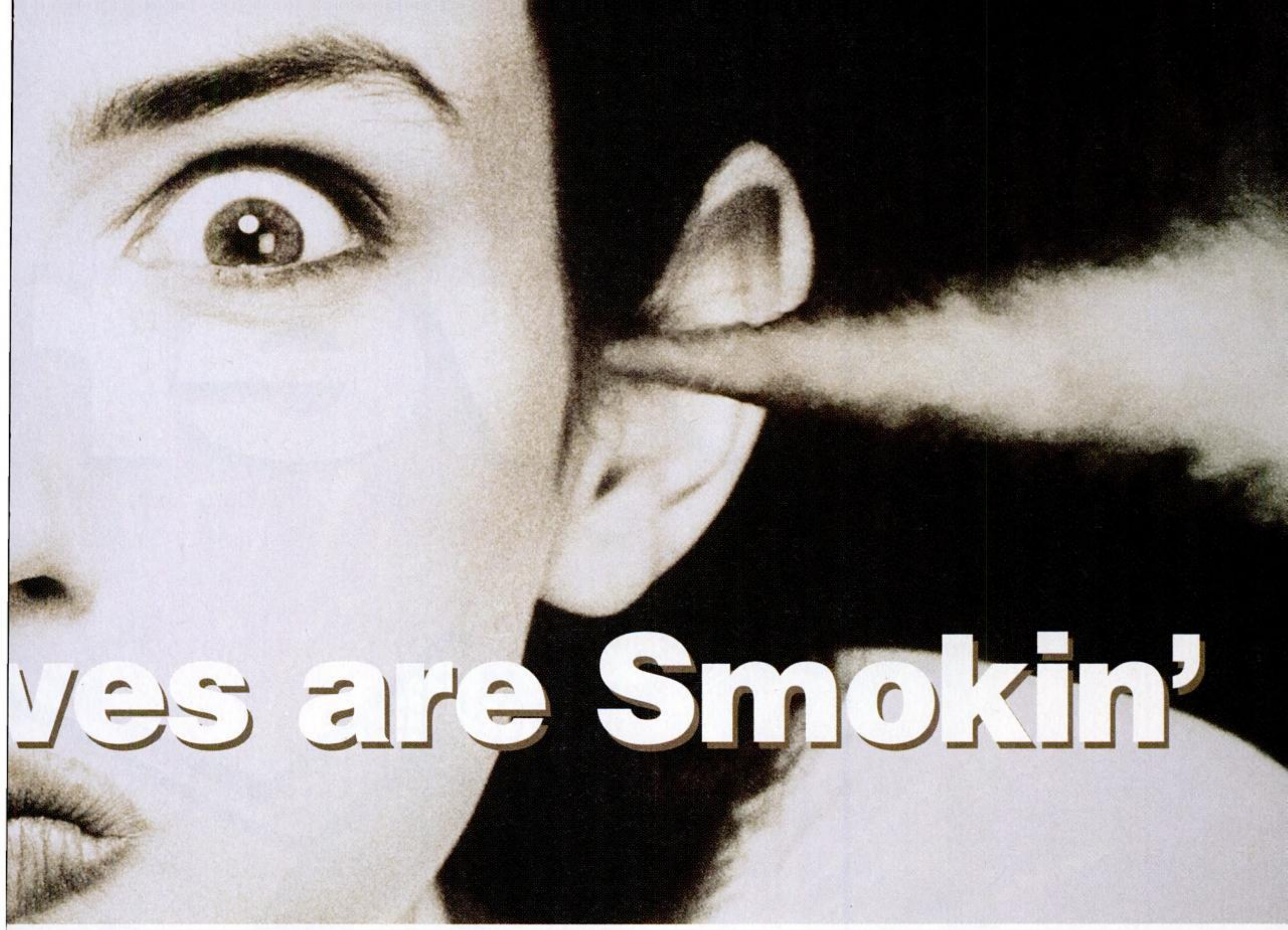

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Operation: Overlord

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clock

Pushing your silicon to the limit

Coaxing extra performance from your CPU without paying an extra penny sounds tempting, doesn't it? You *can* get that performance boost simply by twiddling with your motherboard settings. It's known as overclocking, and it can reset a 300MHz processor to run at 450MHz and beyond.

Thanks to more efficient manufacturing processes, CPUs are running cooler than ever before. This only encourages power users to forge ahead into overclocking, the most taboo of computing subjects. System vendors abhor it, but people are digging the overclocking scene in a serious way. Chip makers tend not to mind hard-core users who dabble in the dark arts—as long as it's on a personal, CPU-by-CPU basis. The chip makers are much more concerned with unscrupulous dingleberries who overclock CPUs en masse, re-mark them with a higher clock setting, and then sell them at a higher price.

While CPUs have always been the target of overclockers, 3D accelerators are now also feeling the heat. Thanks to a variety of registry hacks and third-party software, pushing 3D accelerator clock speeds is easier than ever.

The route to overclocking is different for CPUs and 3D accelerators, but both share the same danger: possible permanent chip destruction. Push any microprocessor past its spec'd speed and it will heat up more than it should. Heat is the number-one danger for overclockers. It can melt internal circuits and cause all sorts of problems. But, if you're brave enough, read on. We give you four overclocking case studies. They shouldn't be considered definitive how-to articles, but rather examples of what you can do with specific CPU/motherboard combos. The key is to absorb the general conventions of overclocking and then apply this knowledge to your own rig.

For more overclocking instruction, go to **www.maximumpc.com** and look for our overclocking articles in the Re:Print section.

In general, all CPU overclocking is accomplished by tweaking either your BIOS or jumper settings to increase the CPU multiplier or system-bus speed (a CPU's speed is determined by the speed of the system bus multiplied by an arbitrary number, aptly called a multiplier). And, of course, one must always prepare for increased CPU heat by installing extra cooling devices. We close out Operation: Overclock with a look at cooling solutions.

A word about our case studies: We were able to adjust bus and multiplier settings through simple motherboard BIOS adjustments. If your BIOS doesn't offer access to these settings, you'll need documentation on which physical motherboard jumpers adjust bus and multiplier values. Also, *Maximum PC* is not responsible for any damage or downtime incurred due to overclocking—proceed at your own risk! (All the ill mojo is described in our Meltdown Alerts.)

Overclocking can be the doorway to speed nirvana. But before you start on this journey, you must do two things: 1) Have your motherboard manual handy. If something acts the fool on your system, you won't have Internet access to download the latest help file. 2) Write down all your original motherboard multiplier, jumper, and voltage settings to ensure you can put everything back to normal in case of mishap.

If you aren't afraid of a little extra power, turn the page and become an overclocking guru.

by Andrew Sanchez

FEEL THE BURN

P200 MMX 52
Celeron 300A 53
Pentium II 266MHz . . . 54
TNT Videocard 55
Keep it on Ice. 56

PHOTOGRAPHY BY AARON LAUER

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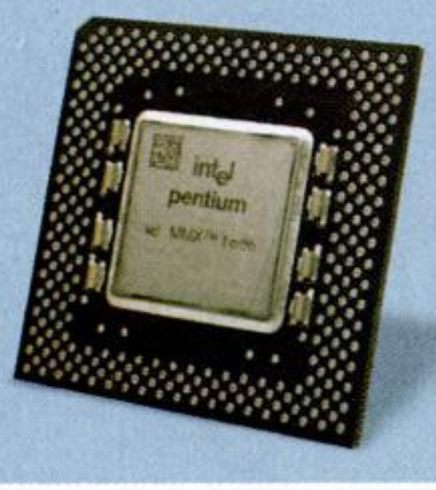
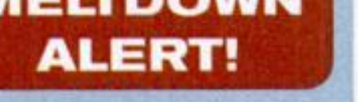


Intel's 200MHz Pentium was the bomb two years ago, when MMX was the new kid on the block. Now it's Intel's moldy-oldie. Regardless, you can still squeeze some performance out of this ol' warhorse. Let's see how far she'll go.



Electromigration

Electromigration is the process by which a CPU's circuits break down due to electrical erosion. Just like a raging river cutting through a valley, electricity can actually erode a CPU's circuit paths. Critics say the process is greatly accelerated by overclocking. Advocates argue that even if electromigration cuts the life of a processor in half, you're simply looking at shortening a CPU's life from ten years to five years. And we all know that only a caveman would be caught dead with a five-year old computer. Not even the 486 is five years old! Because death-by-electromigration can only be proved with the help of an electron microscope, most overclockers disregard the hype, and run at a higher speed oblivious to what's happening on the submicron level.

▶ Case Study **No.1**

Intel P200 MMX

Step 1 After observing how the processor benchmarked at 200MHz, we jumped to the "CPU Soft Menu" settings in our Abit TX5 motherboard's BIOS. Most mobos use hardware jumpers located on the board itself to set bus and multiplier parameters, but the Abit board saves you the trouble of messing with little physical switches. If you have to go the jumper route, consult your system maker's tech support, and ask for complete documentation on which board jumpers do what.

Step 2 Under the "CPU Operating Speed" BIOS setting, we changed the entry from 200 (see Figure 1) to 233. The BIOS automatically sets a 66MHz x 3.5 setting. We saved the setting and rebooted.

```
CPU Name Is : Intel Pentium MMX

CPU Operating Speed : 200
- Turbo Frequency   : Disabled



CPU Power Plane     : Dual Voltage
- I/O Plane Volt.   : 3.52v
- Core Plane Volt.  : 2.90v
```

figure 1

Step 3 The system came up as a Pentium 166MHz—not good. So we went back into the "CPU Operating Speed" field and tried to define the 233MHz setting manually by going into "User Define" mode and forcing a 66MHz x 3.5 multiplier (see figure 2).

Step 4 Crap! The system was still reading the CPU as a 166MHz part. Damn this CPU auto-detection! Now we'll have to overclock by increasing the system-bus speed instead of the multiplier. Once again going into "User Define" mode, we tried a 75MHz x 3.0 bus setting for 225MHz. Success! The machine posted fine. Feeling frisky, we next proceeded to bump up the system bus to 83MHz. The system came back at 250MHz (83MHz x 3.0) and booted into Windows without a hitch. We ran our slew of benchmarks and looked for system instability. None noted. But the CPU was running a hair hotter than it normally would. It needs active cooling.

Step 5 Observed PCI videocard performance. Overclocking the system bus often pushes the PCI bus past its specification, which results in crashes and graphical glitches. Most mobos will use half the core system-bus speed to figure out the PCI bus speed, so an 83MHz system bus will spur a 41.5MHz PCI bus speed—definitely over the PCI 2.1 spec. On the other hand, some motherboards can keep a constant 33MHz PCI bus speed regardless of system-bus speed. Check your own motherboard manual for details. With the Abit

```
CPU Name Is : Intel Pentium MMX

CPU Operating Speed : User Define
- Turbo Frequency   : Disabled
- External Clock    : 66MHz
- Multiplier Factor : x3.5
- Speed Error Hold  : Enabled

CPU Power Plane     : Dual Voltage
- I/O Plane Volt.   : 3.52v
- Core Plane Volt.  : 2.90v
```

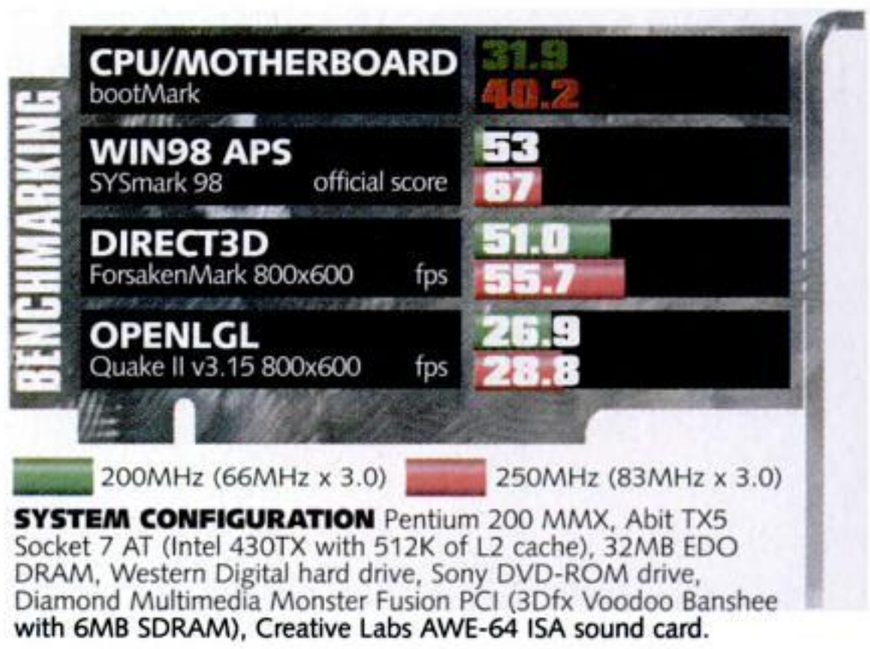
figure 2

motherboard in tow, we pumped *Quake II* and *SYSmark 98* through the PCI Banshee card. No problems observed.

Analysis The TX5 motherboard's core-logic chipset, the Intel 430TX, is buck-naked and featureless compared to today's Super 7 chipsets with AGP and a 100MHz bus. Regardless, many folks have the 430TX, and will want to bump those jumpers and try to overclock them. But don't even think about pushing 200MHz to 233MHz by simply pushing up the multiplier one bin (that is, going from 66MHz x 3.0 to 66MHz x 3.5). When its jumpers are set for a 233MHz Pentium, the 430TX automatically checks to see whether the installed CPU is legit or not. If it is, then voltage will be set automatically and the system will commence booting. But try this on a 200MHz CPU and you'll be greeted with a lower clock setting!

If you want to overclock with the 430TX, check to see if the mainboard supports non-standard system-bus speeds such as 75MHz or 83MHz. If it does, try a 75MHz x 3.0 setting, which will give you 225MHz. You can also try knocking the system bus down to 60MHz and pushing the multiplier up, but you'll be bottlenecking your system bus to a slower speed. Your only other choice would be to go with a non-Intel core-logic chipset, but then you're opening the door to possible incompatibilities down the road.

And, yes, going from 200MHz to 250MHz did give us a performance increase across-the-board, although the floating-point-heavy *Quake II* only yielded roughly two more fps.



SYSTEM CONFIGURATION Pentium 200 MMX, Abit TX5 Socket 7 AT (Intel 430TX with 512K of L2 cache), 32MB EDO DRAM, Western Digital hard drive, Sony DVD-ROM drive, Diamond Multimedia Monster Fusion PCI (3Dfx Voodoo Banshee with 6MB SDRAM), Creative Labs AWE-64 ISA sound card.

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▶ Case Study **No.2**

Intel Celeron 300A

Step 1 With its default configuration of a 66MHz system bus and 4.5 multiplier, this homeboy's baseline is 300MHz.

Step 2 After dabbling with an Abit board during our Pentium 200MHz experimentation, we reaffirmed why Abit is the mobo maker of choice among overclocking folk: The BIOS settings within the CPU Soft Menu (figure 1) allow you many back doors to speed-increase bliss. With the Celeron 300A, we first tried the old "one bin up" overclocking method by setting the motherboard for an automatic 333MHz (66MHz x 5.0). After rebooting the system, we were greeted with a fat error message complaining the CPU wasn't set correctly. So we went back into the BIOS and manually forced a 66MHz x 5.0 setting. And we got another error. We had just encountered the "multiplier lock protection" that folks have complained about. By forcing this CPU to accept only a 4.5 multiplier, Intel hopes to stifle "one-bin-up" overclockers. Too bad Intel forgot about the system bus!

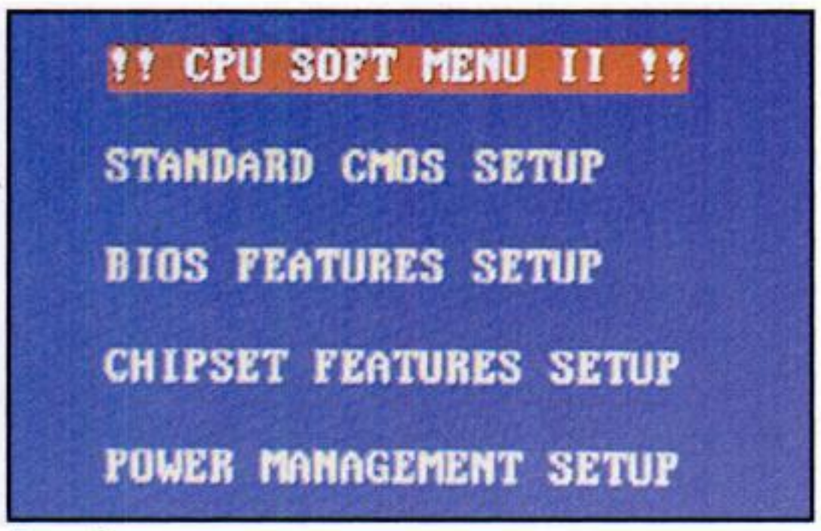


figure 1

Step 3 Leaving the core voltage at the default 2.0 volts, we set the BIOS to configure itself for a 450MHz setting—100MHz x 4.5 (figure 2). Rebooting the system, we got as far as the Win98 boot-up screen before the system coughed up a Blue Screen of Death.

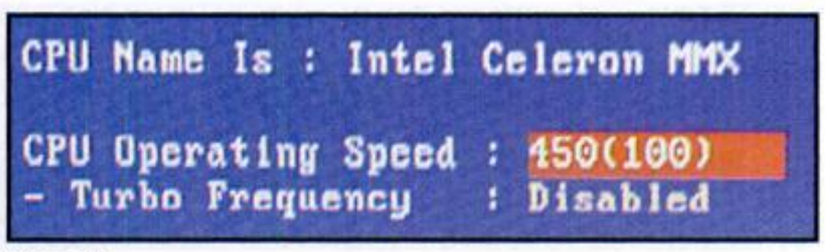


figure 2

Overclocking a Celeron A this way often requires voltage tweaking to ensure proper power. Time to start fiddling with the voltage settings.

Step 4 With a 2.05-volt setting, we rebooted the system. Again, the system crashed. With a 2.1-volt setting (the unofficial voltage for an overclocked Celeron A), we managed to get into Windows 98 and run some benchmarks, but Quake II and bootMark locked up the machine after a couple of runs. So we prepared to enter the upper-end of voltage country.

Step 5 With 2.2 volts humming under the hood, we held our breath and rebooted. No problems posting, and Windows loaded without any errors! Excellent. Benchmarking went off without a hitch—the rig even ran SYSmark 98 (our most time-consuming benchmark at two-plus hours) without a problem. As you can see from the test results, an overclocked Celeron A puts out mongo extra performance.

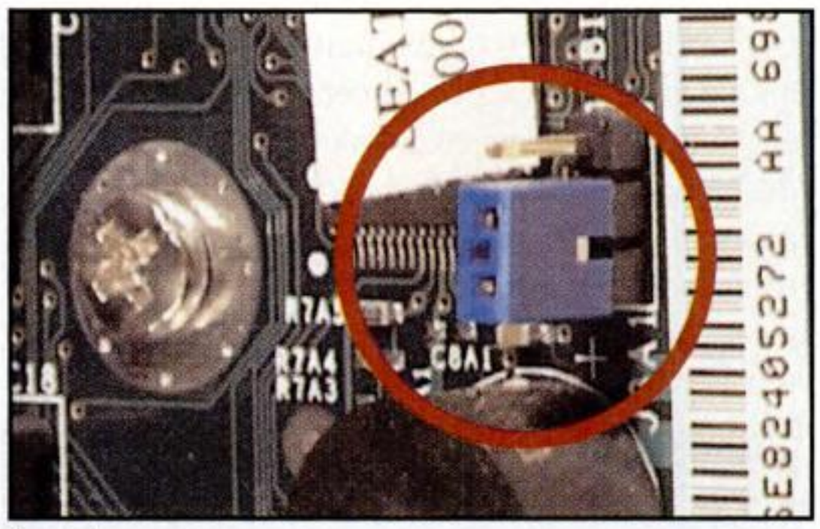
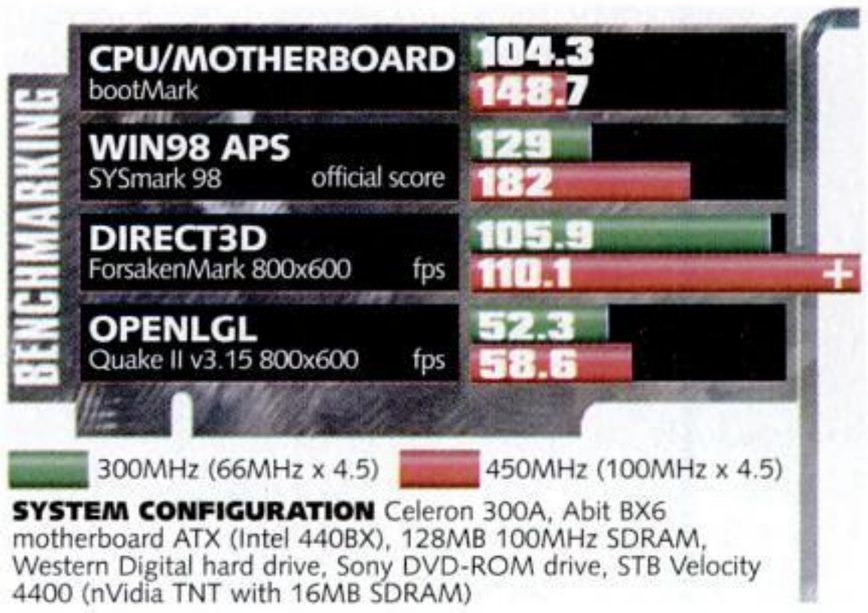


figure 3

Analysis With the proper mobo and settings, you can get an extra 150MHz out of a 300A and not break a sweat. But don't bother with those wimpy 440EX motherboards—you'll need a 440BX-based board, which is spec'd for a 100MHz bus. The obvious choice would be any of Abit's boards, but if you already have a standard BX-based board, be aware that sometimes you can "evoke" BIOS system-bus settings by moving the plastic tab on the jumper in the lower-right-hand corner of the board (figure 3). In its "off" state as pictured, the tab covers the bottom two of three pins. Turn off your machine, move the tab to cover the top two pins, and reboot your machine; it will automatically enter the BIOS. Under the new Maintenance settings, change your processor speed appropriately (if you're given the option), save changes, turn off your machine, put the tab back over the bottom-two pins, reboot, and enjoy your new speed! This trick is of course also useful for the faster P-II systems, which use the 440BX chipset by necessity.



SYSTEM CONFIGURATION Celeron 300A, Abit BX6 motherboard ATX (Intel 440BX), 128MB 100MHz SDRAM, Western Digital hard drive, Sony DVD-ROM drive, STB Velocity 4400 (nVidia TNT with 16MB SDRAM)

Mission: Take the much-celebrated Celeron 300A through the bin cycle. This hottie is renowned as one of the most overclockable CPUs. If you don't think you can add 150MHz to it, think again!

MELTDOWN ALERT!

Glitches

Even if you get your overclocked machine to enter Windows, you still might experience glitches. These dinks can include graphics sputtering, mouse trails, intermittent system freezes, system crashes, bizarre error messages, and incorrect calculations. In fact, incorrect calculations may be the most insidious problem: Your system appears to run fine, but how are you to know if your application is hiccuping on math behind the scenes?

If you experience problems, you should reset your processor to its original speed. As columnist Tom Halfhill says, "Reliability is more important than a 10% performance gain. I'd add more memory or buy a better graphics card. Overclocking is number 20 on my list."

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Folks bought into the P-II 266 with a passion, so it's only proper that we try to get some extra juice out of the ol' boy. The fabled multiplier lock is a threat with these older P-IIs, so we may encounter some chop.

MELTDOWN ALERT!

Voided Warranties

Before you commence a-clockin', be aware that most manufacturers will void the warranty for every part in your machine if they determine your CPU died during jumper hijinks. We took a trip over to www.sysopt.com, where they've set up an overclocking survey. Out of 8,540 overclockers, 7,347 respondents said they have never ruined a CPU. 331 people said that overclocking didn't hurt the processor, but damaged something else in their machine, and 862 said they had damaged or completely fried the CPU. The lesson: Go one bin up and test for stability! Also make sure you have the proper voltage setting for your new CPU speed–most instant death scenarios result from bad voltage. Consult your mobo manual.

► Case Study **No.3**

Pentium II 266MHz

Step 1 Before we start our overclocking journey, we need to identify our Pentium II. There are two different models of the processor. The older version—made during the days when the P-II was code-named Klamath—uses non-ECC L2-cache and a .35-micron fab process. The newer version—code-named Deschutes—uses ECC L2 cache and a .25-micron process. The CPU we used for testing was the older Klamath version. We determined this by looking at the model number found on the top of the CPU (figure 1). Code number SL28L designates an older 266MHz CPU. To determine the exact specs of any P-II, go to **developer.intel.com/design/pentiumII/qit** for a complete listing of model numbers. Intel's older 266MHz Pentium II runs under the 66MHz system-bus regime. So, with a 66MHz x 4.0 setting, we proceeded to test away, recording the results.

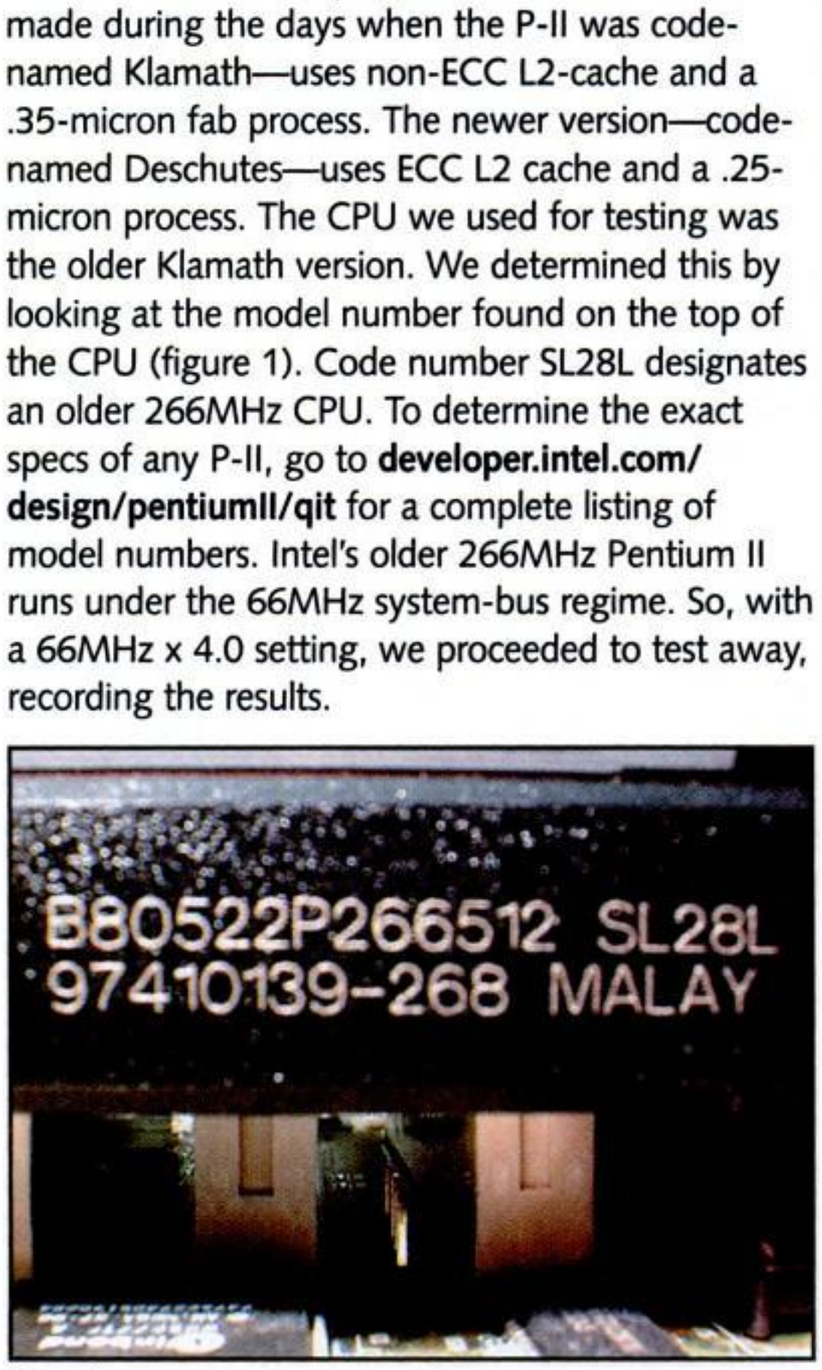


figure 1

Step 2 Motherboards from Soyotek (a.k.a. M-Tech) also use a soft BIOS, allowing for jumperless adjustments of CPU clock speeds—the maximum setting is 100MHz x 8.0 for 800MHz! While you can adjust system-bus speeds and multipliers, you can't monkey around with voltage—this is taken care of automatically. Happily frolicking across the Soyotek BIOS, we took the P-II 266's standard 66MHz bus to 100MHz. More precisely, we defined a 100MHz x 3.0 setting to achieve 300MHz (figure 2). Rats. No dice. The system automatically dumped back down to a 200MHz.

Step 3 Going back into the BIOS, we started fiddling with other system-bus speeds in tandem with a 4.0 multiplier. We didn't even consider raising the multiplier setting past the CPU's default 4.0; we've heard too many tales of late-model P-IIs being afflicted with a lock that denies raising the multiplier setting past its default (lowering the multiplier, as we did in Step 2, can be a different story altogether, however). Regardless, other system bus-settings—68MHz x 4.0, 75MHz x 4.0, and 83MHz x 4.0—would not cough up 274MHz, 300MHz, and 333MHz respectively.

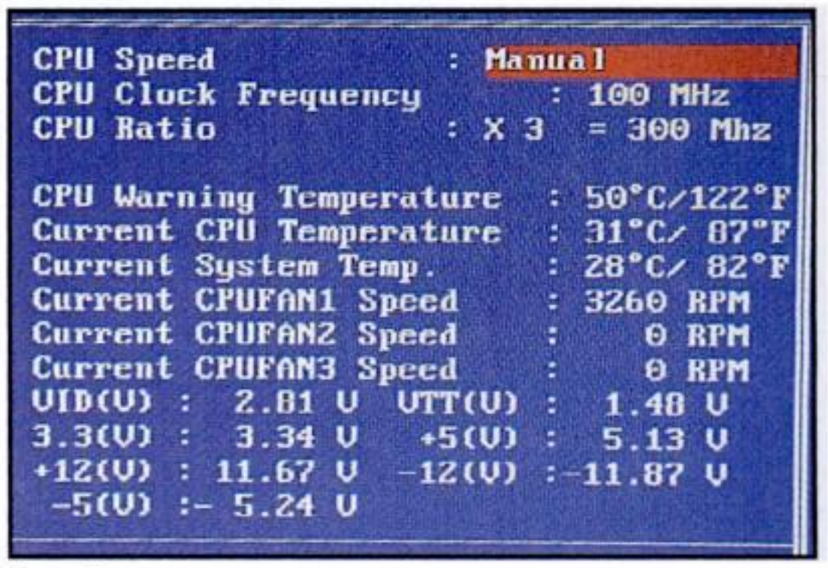
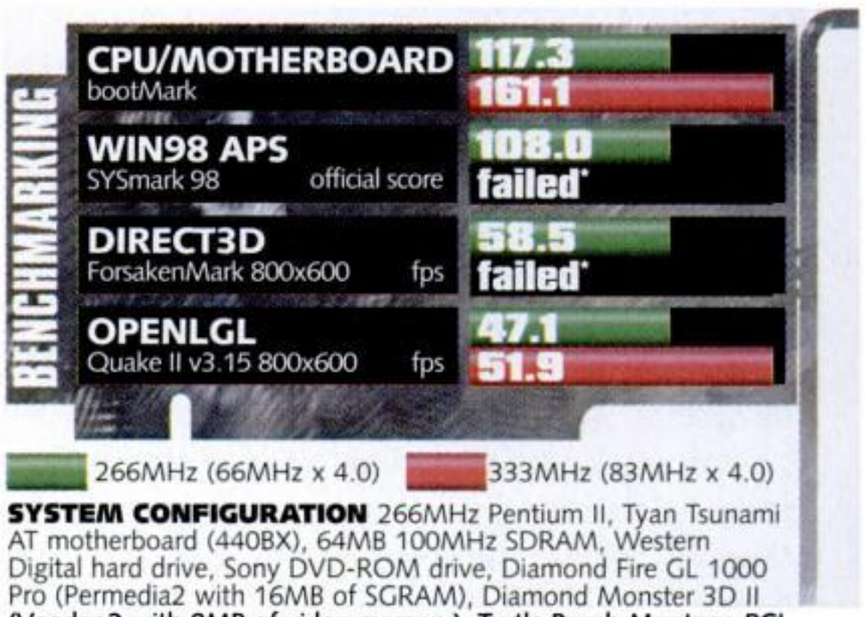

CPU Speed : Manual
CPU Clock Frequency : 100 MHz
CPU Ratio : X 3 = 300 Mhz
CPU Warning Temperature : 50°C/122°F
Current CPU Temperature : 31°C/ 87°F
Current System Temp. : 28°C/ 82°F
Current CPUFAN1 Speed : 3260 RPM
Current CPUFAN2 Speed : 0 RPM
Current CPUFAN3 Speed : 0 RPM
VID(V) : 2.81 V VTT(V) : 1.48 V
3.3(V) : 3.34 V +5(V) : 5.13 V
+12(V) : 11.67 V -12(V) : -11.87 V
-5(V) : - 5.24 V

figure 2

Step 4 Unfortunately, the Soyotech motherboard foiled our overclocking efforts at every turn. We also tried using a Gigabyte mobo, but failed to bypass the multiplier lock out. Then we turned to a Tyan Tsunami AT motherboard—and found success! With an 83MHz x 4.0 setting, the Tyan board booted into Windows and ran reasonably fine under a 333MHz regime. We ran a few benchmarks and called it a day.

Analysis Not every motherboard is overclockable. Motherboards and BIOS revs make all the difference in the world with these older Pentium IIs. We had the best luck using the Tyan motherboard and its AMI BIOS, which employs a point-and-click GUI interface. It allowed us to set the system-bus speed to 83MHz, but not 100MHz.

Unfortunately, the AWARD BIOS-based boards (the Soyotech and Gigabyte) refused to go past 266MHz. Changing the soft jumper multiplier resulted in the BIOS announcing setup errors, and a warning that the CPU was indeed locked down at a 4.0 multiplier. That's not to say all AWARD BIOS-based boards are bad for overclocking this specific CPU. Results vary, so choose your motherboard carefully. A great place to check for success stories is on Usenet newsgroups. Popular motherboard vendors—such as Abit, Tyan, and ASUStek—have their own newsgroups devoted to each company's hardware.



SYSTEM CONFIGURATION 266MHz Pentium II, Tyan Tsunami AT motherboard (440BX), 64MB 100MHz SDRAM, Western Digital hard drive, Sony DVD-ROM drive, Diamond Fire GL 1000 Pro (Permedia2 with 16MB of SGRAM), Diamond Monster 3D II (Voodoo2 with 8MB of video memory), Turtle Beach Montego PCI sound card (Aureal A3D 1.0) * Failure could be due to videocard and soundcard incompatibilities as well as system instability caused by overclocking.

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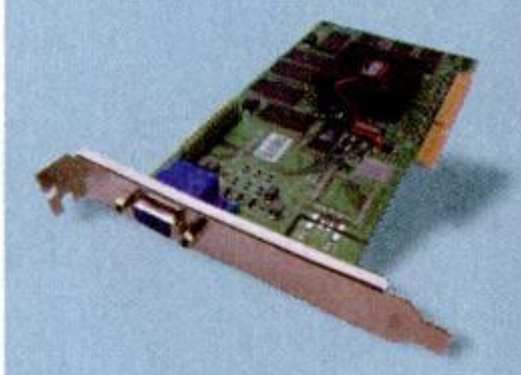


CPUs aren't the only silicon to feel the overclocking heat. 3D accelerators can also be juiced up for more speed. Here's a look at how to squeeze extra performance out of nVidia's super-popular TNT chip.

▶ Case Study **No.4**

Hercules Dynamite TNT videocard

Step 1 The Hercules Dynamite TNT comes with its own control panel that lets you overclock the memory and 3D processor. But many TNT boards, especially those that come in machines from Dell and Compaq, use stripped-down, featureless drivers. For these situations, you'll want to get your hands on Entech's neato-burrito program *PowerStrip*. Among other things, this program enables overclocking of the TNT card's memory and processor and will work with almost every videocard available.

Drop by **www.entechtaiwan.com** for the latest version of God's gift to 3D accelerators.

Step 2 Hercules defaulted its card settings to 100MHz memory and a 90MHz core processor speed per nVidia's recommended settings. Because TNT uses a .35-micron manufacturing process for its accelerator chip, the chip runs pretty warm to start with (a smaller 0.25-micron fab would run a lot cooler). But the card's integrated fan helps out tremendously. We ran two benchmarks, *Quake II* and *Turok 2: Seeds of Evil* (a new DirectX 6 game), to determine performance at these memory and processor speeds.

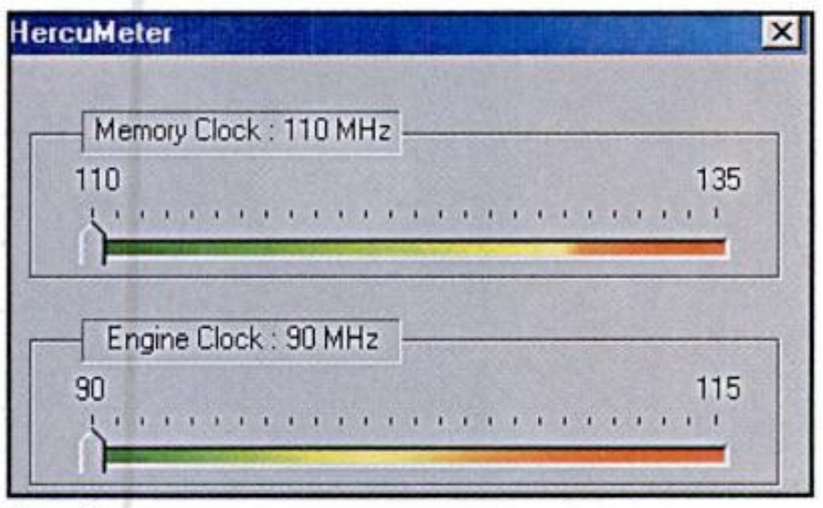


figure 1

Step 3 We started our overclocking by upping the card's core processor to 100MHz. Getting to the clock setting with the Hercules board is simple: use the HercuMeter (figure 1) found in the Hercules Utilities tab in Advanced Display Properties. If you're using *PowerStrip*, right-click the left-most icon on the Strip menu (it's a picture of a monitor with a rainbow over it). Now go to the Advanced Options submenu, choose About the PowerStrip, and hit the Performance tab. You'll see the appropriate sliders for increasing memory and processor speed (figure 2). Move the sliders to faster settings and apply your changes.

At a core processor speed of 100MHz we experienced no problems, so we benchmarked our card and recorded the results.

Step 4 We next upped the memory clock speed to 110MHz. Again, no problems. Finding the right slider settings will be the most time-consuming part of your journey, as even a 1MHz change can wreak havoc on your system. If you encounter problems,

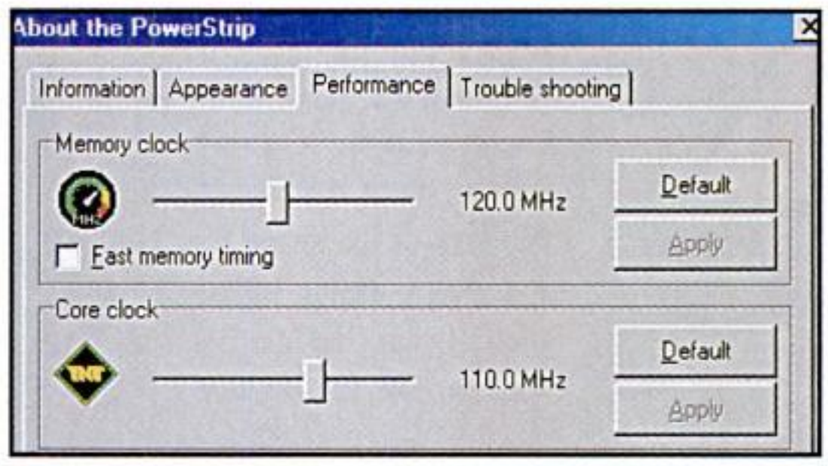
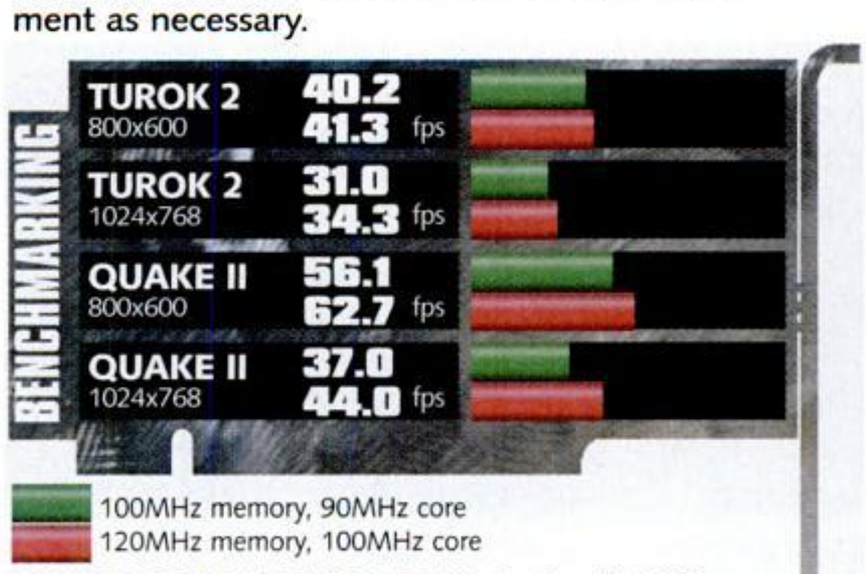


figure 2

just notch down your settings bit by bit until you reach stability. For our particular TNT card and system, we eventually found happiness with 120MHz for memory and 110MHz for the core processor.

Step 5 Fired up all the 3D benchmarks—everything worked beautifully with framerate increases from 1fps to 7fps. Normally, you'd need to upgrade your CPU by at least one bin to see similar performance boosts. To test overclocking longevity, fire up your favorite looping 3D game demo and let the beast run overnight. If it's still running the next morning, you're good to go. Also, be on the look out for dropped textures, stray pixels, and missing polygons. If you find these glitches, clock back down.

Analysis Cooling is paramount with videocard overclocking. Most modern 3D accelerators run under a 0.35- or 0.25-micron process, but the sheer number of transistors packed into such a small footprint makes for a hot time on the PCB. Most new cards come with at least a heatsink, which gives the chip better heat dissipation, but this is often not enough. If you only have a heatsink on your TNT, replacing it with a heatsink/fan combo will help toward keeping that little ASIC chillin'. You may also investigate 3DfxCool's line of add-in fans, but be forewarned that altering your card in any way voids its warranty. Other videocards have different thermal characteristics than the unusually hot-running TNT, so experiment as necessary.



SYSTEM CONFIGURATION 400MHz Pentium II, 16MB Hercules Dynamite TNT, 64MB 100MHz SDRAM, Intel 440BX motherboard, Windows 98 with DirectX 6.0.

MELTDOWN ALERT!

Too Much Heat

All integrated circuits, be they CPUs or 3D accelerators, generate greater amounts of heat the higher you clock them. If you run them beyond their spec'd frequency, you run the risk of literally fusing your circuit paths or slowly burning them out over time. Quick death means an instantaneous, irreversible system crash. Slow death means increasingly frequent lock-ups and glitches. Excessive heat can even damage other system parts. The only solution is to apply one of the cooling strategies on the next page. More-efficient fab processes help circuits run cooler, but don't feel invincible just because your CPU is fabbed at 0.25-micron. At 300MHz, that fab has room to grow. At 450MHz, it's already pushing its limits and definitely needs cooling help.

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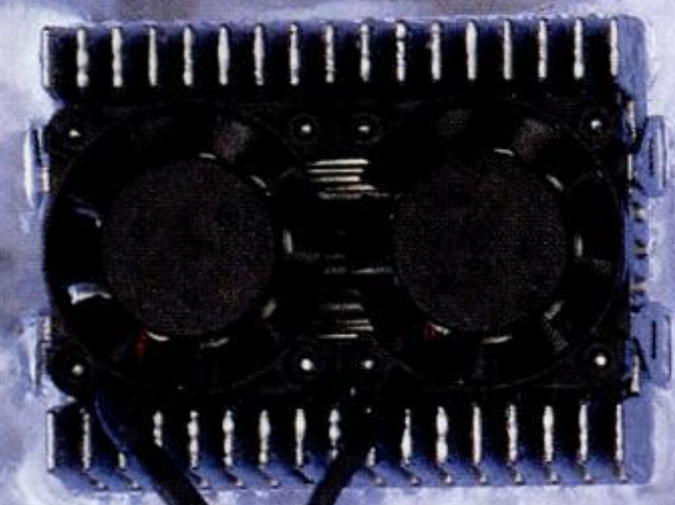
Keep it

Without some type of device drawing heat away from its circuitry, an integrated circuit will cook in its own juices. Here are some common ways to keep your silicon chillin'.

Passive cooling The simplest way to cool any processor is to attach a massive heatsink to it. This heatsink acts as a dissipater, drawing heat away from the processor and distributing the frisky electrons into the surrounding environment. The old adage "bigger is better" holds true for heatsinks. The greater the surface area of the heatsink, the better the heat dissipation. Increasing surface area can also be accomplished via finer, more numerous heatsink fins.

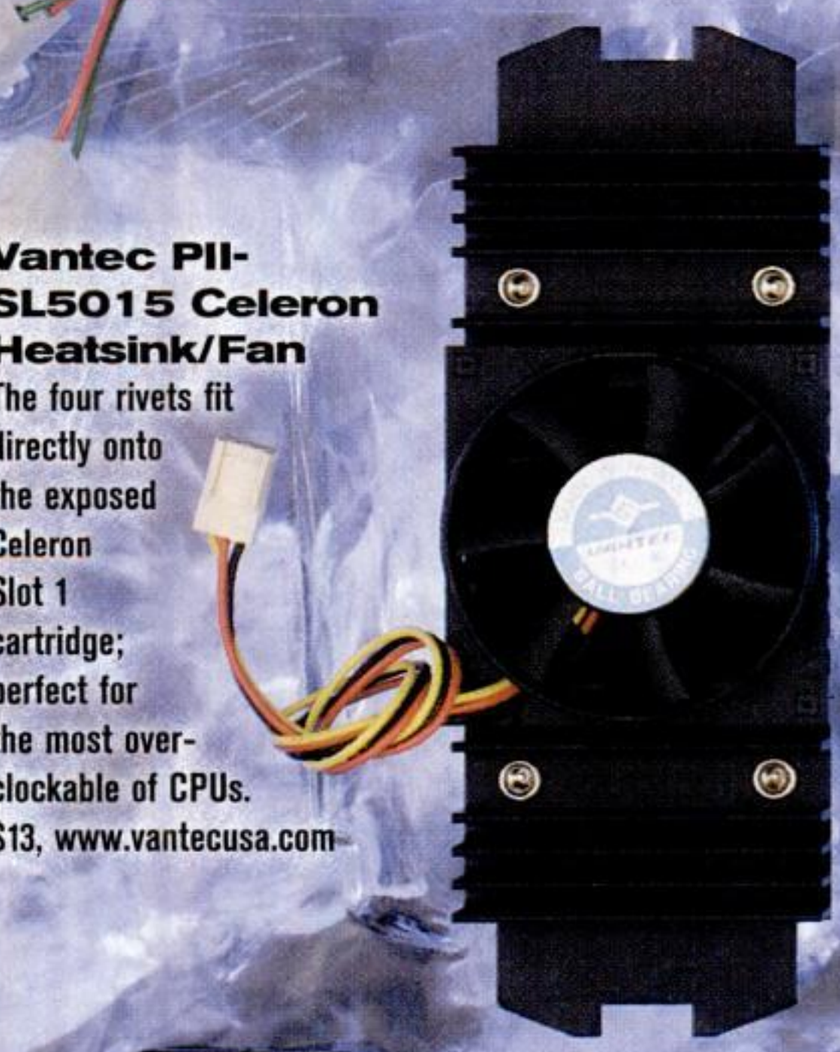
Active Cooling This strategy throws a fan onto the heatsink itself. The fan promotes air circulation among the heatsink fins, which in turn promotes a cooler environment. Most modern CPUs employ active cooling, although with the advent of the ATX motherboard formfactor—which positions the CPU right next to the ATX power-supply fan—some vendors are reverting back to simply slapping a massive, extruded heatsink on their CPUs.

Peltier Cooling Some heatsinks incorporate a thermoelectric cooler—or Peltier element—into their design. When this thermoelectric cooler (TEC) is wired to a DC power source, the electric current causes heat to move from one side of the TEC to the other. Naturally, this creates a hot side and a cold side—and the cold side of the element sits right on top of the CPU (the hot side straddles the heatsink). Some caveats: Water condensation has always been a concern with Peltier cooling, as the cold side does get icy to the touch. Also, while the cold side of the Peltier element chills the CPU, the hot side creates more heat for the rest of your components, so you'll have to anticipate the burn. Finally, Peltier coolers do draw significant power, so make sure your power supply can handle the drain.



PC Power & Cooling Socket 8 Dual CPU Cool
Straight outta the Terrordome, this mad-coolin' brute's post-apocalyptic design will scare heat off your Pentium Pro. $32, www.pcpowercooling.com

From fans to heatsinks to combo units to alarms, cooling devices are just plain chill. Here's the tip of the iceberg—hundreds more units can be found online.



Vantec PII-SL5015 Celeron Heatsink/Fan
The four rivets fit directly onto the exposed Celeron Slot 1 cartridge; perfect for the most over-clockable of CPUs. $13, www.vantecusa.com

Micron Socket 7 "Blue Boy"
This fancy sink came attached to a stock P233 in an old Micron machine. It was so pretty, we ripped it off the proc and put it on ice. The "parking garage" design eschews fins for multileveled wafers.

Software Different utilities that claim to help overclockers cool their CPUs have recently popped up across the Internet. *Rain*, *CPUIdle*, and *Waterfall Pro* are three such programs. They work by shutting down certain processing functions while the processor is running, effectively putting parts of the CPU into an idle state. According to the *CPUIdle* web site: "*CPUIdle* lowers the CPU temperature by disabling it when not needed. This prolongs the CPU life (a decrease by 10°C doubles the life span) and cuts power consumption. Unlike normal power

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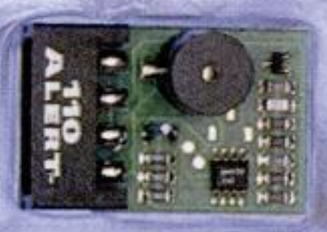
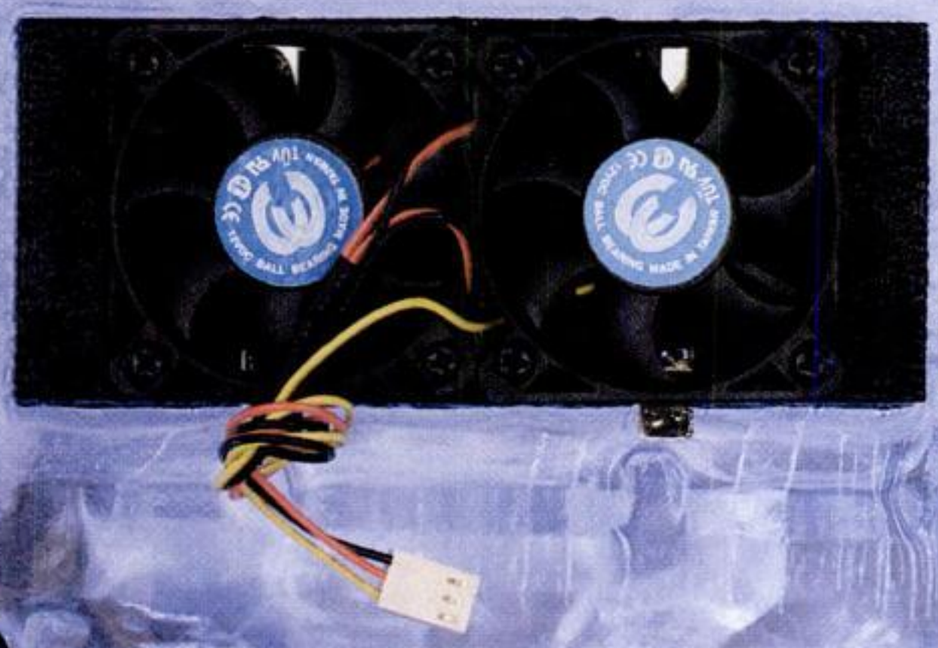
on ice

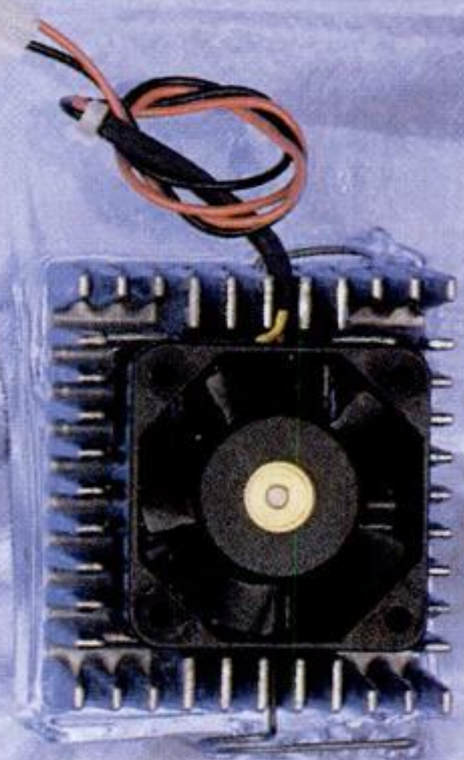
3Dfx Cool 3Dfx fan
Perfect for that original Voodoo card–and designed low-pro to shimmy between the tightest of slot scenarios. $16, www.3dfxcool.com

PC Power & Cooling 110 Alert Overtemperature Fan
This little sentry lets out a whistle whenever your internal case temperature enters the alarm zone beyond 100 degrees. Patience, patience, Piccolo Pete! $17, www.pcpowercooling.com



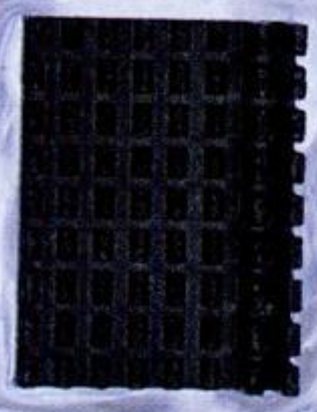


TennMax VIVA Twin Fan P2 Cooler
Cool fan-on-fan action spells chilly times for your hot-n-breathy Pentium II. $30, www.tennmax.com



PC Power & Cooling CPU-Cool Z1
This ugly mutha is spec'd to cool Socket 7 procs running from 233MHz to 350MHz. $21, www.pcpowercooling.com

TennMax Stealth Voodoo2 Cooler
Designed to cover all three Voodoo^2 processing chips, the thin profile fits on hard drives too. $24, www.tennmax.com



TennMax 440BX Heatsink
For the truly safety-conscious, a sink for your core-logic. Why not just throw a heatsink on everything? $3, www.tennmax.com

management, *CPUIdle* is active all the time and works even when you're actively using your computer!"

Maximum PC columnist and CPU magus Tom Halfhill isn't buying the hype. He says, "Frankly, the whole idea seems pointless for a desktop PC, which should have plenty of room inside the box and a strong enough power supply to keep the CPU cool with fans and vents. If the CPU is properly cooled with airflow, it doesn't need a trick program. The program might have some use in a laptop, but the CPU, OS, and BIOS should already be doing some of those things, anyway. It's even more pointless to overclock a CPU and then cap its performance at less than 100 percent to keep it from overheating. That's like souping up a car engine and then installing a governor to keep you from speeding. Why bother?" ✹

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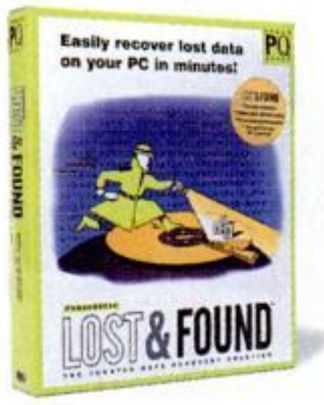
Now you can own the same solution that data recovery centers use!

It doesn't take much to lose your data. One careless push of a button or a failed hard drive can put your irreplaceable files and months of hard work in critical condition. Fortunately, with Lost & Found from PowerQuest®, bringing your lost files back to life is just as easy. Whether you're faced with the inconvenience of a single lost file or a catastrophic hard-drive crash, Lost & Found can save you from having to recreate files or spend thousands of dollars to send your hard drive to a data recovery center.



Lost & Found lets you quickly restore data that has been accidentally or intentionally deleted, and reclaim files from corrupted media caused by a disk crash or logical system failure. You can even recover data if the partition has been reformatted or if the FAT tables have been destroyed. As long as your disk is still spinning, Lost & Found can locate and recover almost any file, anywhere on your disk. Easy to use and extremely affordable, Lost & Found means you'll never have to worry about data loss again. And that's a diagnosis everyone can live with.

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K6-III

THIRD TIME'S A CHARM

AMD meets the Intel challenge with cache on hand.

Forever playing catch-up to Intel performance levels, Advanced Micro Devices has finally released a processor that competes with the best P6-based CPUs. It's called the K6-III and is essentially a K6-2 with 256K of on-die L2 cache.

But, oh, what a little cache will do ya.

The K6-III's L2 cache effectively converts motherboard-bound L2 cache into L3 cache, a little sleight of hand that pays off in speed dividends that exceed what a mere 256K of L2 would otherwise provide. In short, the most decked-out K6-III systems will sport a grand total of 2,368K of cache—64K of on-die L1, 256K of on-die L2, and 2MB of external L3 on select motherboards armed with the Via MVP3 chipset

60

by **Jon Phillips**

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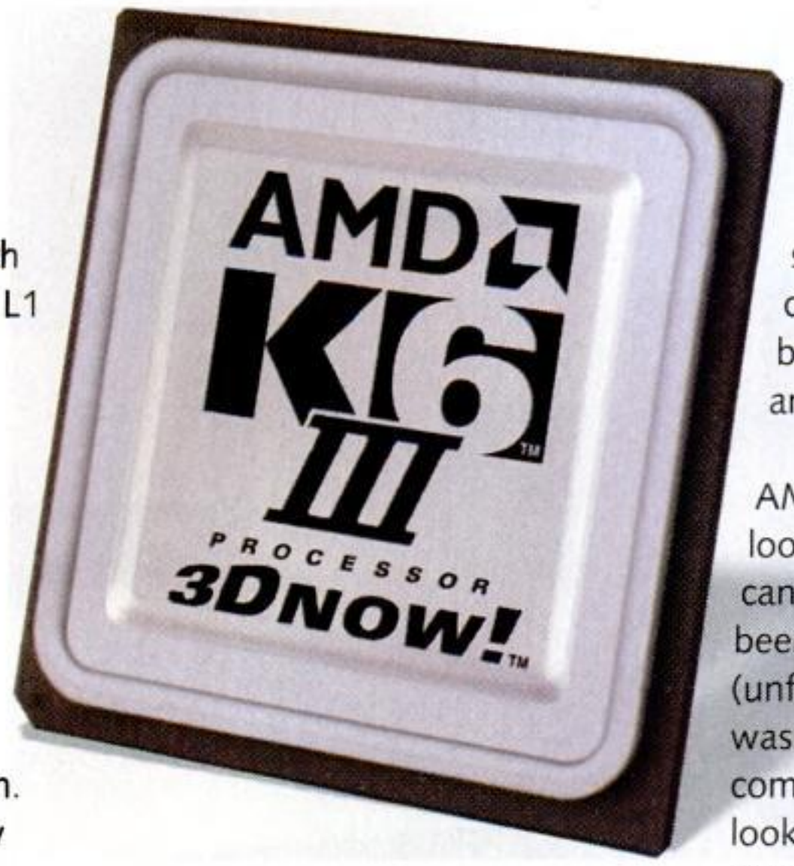

(most Super 7 boards will come with either 512K or 1MB of cache). The L1 and L2 scream at full processor speed, while the L3 runs at the speed of the system bus.

All together, AMD's new "TriLevel" cache design feeds the processor with a wide, steady stream of quickly accessed data. Cache is essentially high-speed memory that stores recently used data that will likely be needed again. Whenever the K6-III needs to chew on a particular piece of data, it can first look for it in L1 cache, the fastest, most electronically integrated data receptacle. If the processor can't locate the data in L1, it next turns to L2, the second-fastest proposition. If the required data doesn't reside in L2, the processor can finally look in L3 before turning to main system memory.

The electronic path between a processor and its cache is faster, simpler, and more direct than the path between the processor and system memory, so drawing data from cache is always the quickest route (god help us if the processor actually has to turn to the hard drive for a data request). By adding a large cache reserve to the K6-2, AMD has completely revamped a processor that was quickly getting stale—all without retooling the CPU's core architecture.

"In evaluating 450MHz versions of both CPU families, we found that the K6-III outperformed the Pentium III by 21 points in the bootMark. In fact, the 450MHz K6-III's score equaled that of a 500MHz Pentium III."

THE SPECS

Processor AMD K6-III with 3DNow!
Interface Socket 7
Die Size 118mm²
Fab Size 0.25-micron
Core Voltage 2.4 volts
Default CPU/Bus-Speed Options
450MHz/100MHz, 400MHz/100MHz
L1 Cache 64K full-speed
L2 Cache 256K full-speed
L3 Cache 512K to 2MB depending on core-logic chipset, 100MHz
Compatible Core-Logic Chipsets
Ali Aladdin V, SiS 5530, Via MVP3
Prices at Launch (lots of 1,000) 400MHz, $284; 450MHz, $476

AMD is pitting the K6-III directly against Intel's Pentium III and touting all sorts of enticing price-to-performance ratios. The K6-III launches at 400MHz and 450MHz for $284 and $476, respectively. The Pentium III, meanwhile, launches at 450MHz and 500MHz for $496 and $696, respectively. In evaluating 450MHz versions of both families, we found that the K6-III outperformed the Pentium III by 21 points in the bootMark, which tests basic CPU, cache, and core-logic chipset power. In fact, the 450MHz K6-III's score of 239 equaled that of a 500MHz Pentium III. And that 239 was immensely better than the puny 150 mustered by a 400MHz K6-2, indicating the K6-III is bringing much more to the table than a mere 50MHz jump in clock speed.

Unfortunately for AMD, the K6-III didn't whup the Pentium III across-the-board (though it must be noted that our K6-III test system included only 512K of L3 cache; more L3 could have told a different story). AMD has certainly closed what has historically been a vast performance gap, but it appears Intel still makes the best processor for applications that demand floating-point power, such as 3D rendering apps and image editors. Of course, the K6-III does include the 3DNow! instruction set, so optimized drivers and game code ensure that 3D gaming won't be hampered by AMD's relatively anemic floating-point unit.

The K6-III sits in the middle of AMD's processor line-up. If you're looking for a "value" processor, you can go with the K6-2, which has just been clocked to 450MHz for $203 (unfortunately, a 450MHz K6-2 wasn't available at press time for comparative benchmarking). If you're looking for a whole new paradigm, you can wait for the potentially megapowerful K7, which, according to AMD, is still on track to be released before July (see our January 1999 issue for a full K7 preview).

You may be wondering why AMD is even releasing the K6-III when K7 is just around the bend. Answer: Because the company saw a relatively easy way to challenge the Pentium III head-on without investing an immense amount of intellectual energy. Given our benchmark findings, we don't think the K6-III offers better overall performance than the Pentium III, but in basic integer calculations it's certainly playing in the same league. And at a cheaper ticket price. If you want to upgrade your Super 7 motherboard with a K6-III, simply grab an updated BIOS from your board manufacturer's web site and make sure you increase your voltage setting from 2.2 volts to 2.4 volts.

AMD likes to note that 3DNow! developer support has a nine-month jump on Intel's competing Streaming SIMD Extensions, and that the two SIMD floating-point technologies offer equal power boosts to 3D gaming. Given the current complexity of 3D games and the current fill-rate ceiling of 3D accelerator cards, we have to affirm that the K6-III is a more than adequate gaming CPU—just as long as you have robust 3DNow! optimizations on either the driver or game-code level.

By the second half of this year, AMD plans to migrate its CPU production from a 0.25-micron to 0.18-micron process. Assuming the K6-III is one of the processors that fabs down to this size, we should be seeing some blazing-fast frequencies—550MHz, 600MHz, 650MHz—who knows. During this same time frame, the K7 should also be ruling all of processordom with the most advanced core architecture, memory bus, and caching schemes the performance desktop world has ever seen.

If by 2000 AMD has somehow wrested CPU dominance away from Intel, we can all point to the K6-III launch—AMD's first legitimate challenge to Intel performance—as the beginning of the end. And it's doing it with cache, and all on Socket 7.

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SHOWDOWN AT 450MHz

K6-III, Pentium III, and Pentium II Vie for the Title of Processor Poobah

In a three-way row with Intel's finest, we found the K6-III has integer power to spare—the fact that it skunked Intel in the bootMark test is an unprecedented triumph for AMD. And our particular K6-III test system did it with only 512K of L3 cache. We can't wait to see what a full meg of L3 will do. But the K6-III continues the AMD tradition of stumbling on floating-point calculations. Our 3D rendering, *Photoshop*, and OpenGL gaming tests are highly floating-point intensive, so it's no surprise that the K6-III lagged behind Intel's P6 architecture in these benchmarks. We want the K7, and we want it now.

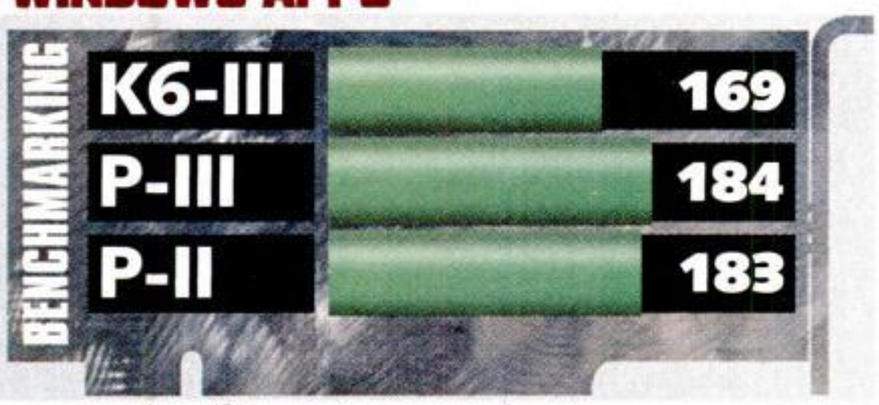
The K6-III also fell a bit short in the SYSmark Windows apps benchmark. AMD says this benchmark—which times scripted runs through 14 real-world applications—is unfairly kind to Intel CPUs. AMD believes SYSmark includes too many obscure floating-point-intensive apps, and that the benchmark suite doesn't reflect the applications people use in the real world. You can check out the SYSmark suite members yourself by going to **www.bapco.com/sys98k.htm,** but realize this: All of today's processors have power to burn when it comes to simple, integer-rich business apps such as Microsoft *Word* and *PowerPoint*, and Netscape *Navigator*. Hell, you could run those apps on a lame-ass Pentium 200 and never know the difference. But if you're a true power user—a *Maximum PC* reader—you're likely digging deep into floating-point, and for this reason we feel SYSmark is a fair metric for our readers' tastes.

If you're wondering about the 3DNow! versus SSE debate, check out the Direct3D test. The K6-III and Pentium III paced each other, illustrating that the two procs' SIMD floating-point enhancements are essentially equal. Finally, we want to point out that the K6-III is measurably stronger than the K6-2. We couldn't get our hands on a 450MHz K6-2 to conduct direct comparisons, but when we benchmarked a 400MHz K6-2 in a decked-out test bed, we got 150 in the bootMark and 132 seconds in the *Photoshop* test. The K6-III's dramatic improvement over these two scores suggests cache is extremely important—a simple 50MHz in clock speed could never produce such gains.

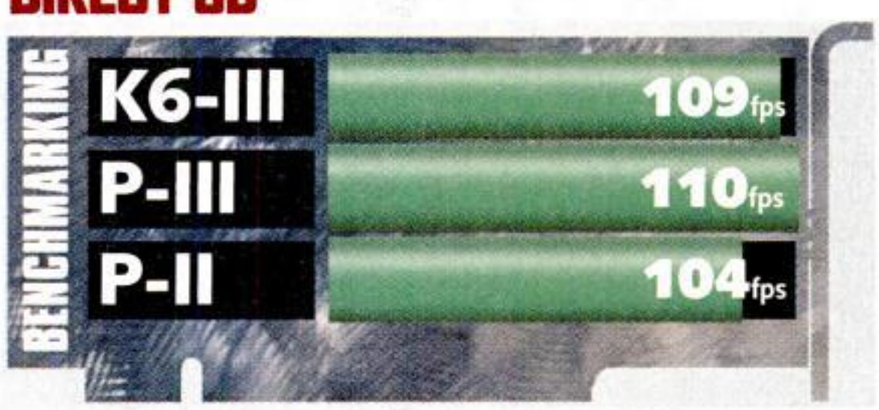
CPU/MOTHERBOARD

DESKTOP PUBLISHING

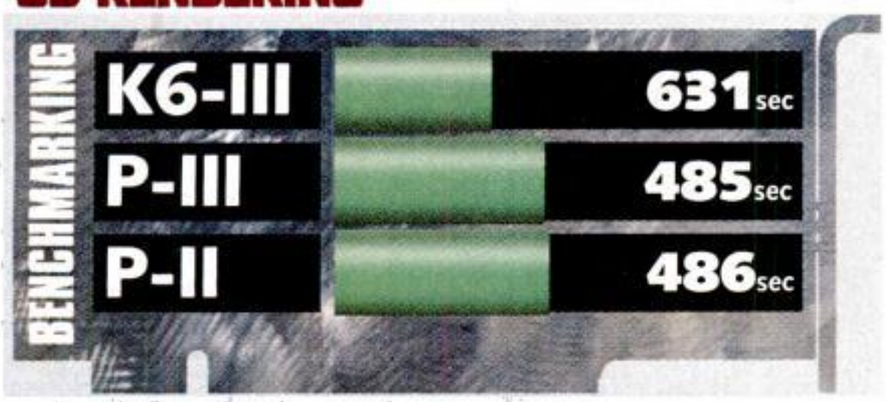
WINDOWS APPS



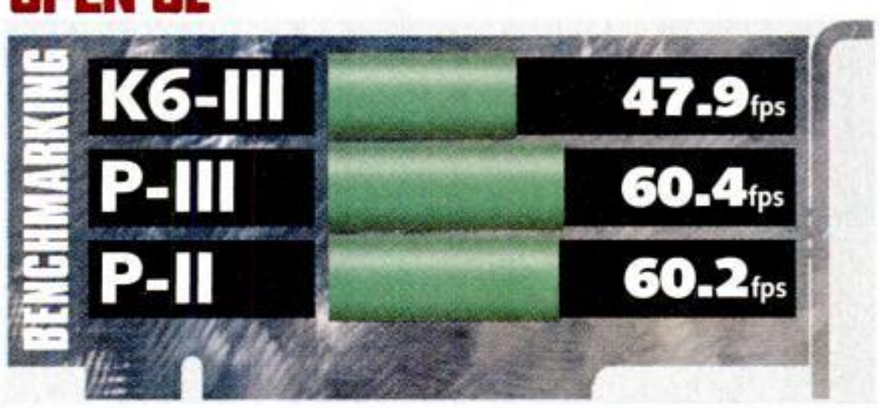
DIRECT 3D



3D RENDERING



OPEN GL



CONTROL SYSTEMS K6-III: 450MHz CPU, 256K 450MHz L2 cache, 512K 100MHz L3 cache, 128MB 100MHz SDRAM, 16MB TNT videocard with 3DNow!-optimized Direct3D drivers, IBM DeskStar hard drive. Pentium III: 450MHz CPU, 512K 225MHz L2 cache, 128MB 100MHz SDRAM, 16MB TNT videocard with SSE-optimized Direct3D drivers, IBM DeskStar hard drive. Pentium II: 450MHz CPU, 512K 225MHz L2 cache, 128MB 100MHz SDRAM, 16MB TNT videocard, IBM DeskStar hard drive.

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Ask the Doctor

Symptom | Diagnosis | Cure

Even the burliest of PCs comes down with a bug every now and then. That's when you need to call The Doctor and get a diagnosis that'll have you up and running in no time. Send your symptoms to: **doctor@maximumpc.com.**

Boat Anchor or Hard Drive?

I'm considering an upgrade to a 400MHz Pentium II, but a friend of mine told me that I don't need a CPU faster than 333MHz because hard drive speeds haven't kept up with the advances in processor speeds. Any processor faster than a 333MHz Pentium II won't improve performance because the processor is waiting on the hard drive to relay data.

Is this true?

—Michael Lee

A computer's hard drive always processes data much more slowly than the CPU, but your friend's misinformed advice doesn't take into account how computers actually work. In fact, the CPU is a ravenous number-crunching machine that's constantly looking for new data to chew on. When it runs out of data, if first looks for fodder in high-speed cache—L1, L2, or L3 cache. If it can't find the appropriate pieces of data in cache, it turns to slower system memory. If no luck there, it finally turns to the hard drive, the slowest link in the data chain.

Your CPU's performance doesn't drop to accommodate a slow hard drive. In fact, a fast CPU can lessen the impact of a slow hard drive. And in general, it's a good idea to always go with the fastest components possible in every phase of your processing chain. The sole exception is in 3D accelerators: Sometimes your CPU can't feed triangles quickly enough to the accelerator, and the videocard never realizes its full rendering potential.

"Your CPU's performance doesn't drop to accommodate a slow hard drive. In fact, a fast CPU can lessen the impact of a slow hard drive."

Virtual Necessities

I'd like to know if there would be a performance increase if I installed 128MB of SDRAM and turned off Windows' virtual memory. I'm annoyed at how my hard drive constantly chugs away at god only knows what even when I'm just playing solitaire. If not 128MB, is there a safe amount of memory I can install that will allow me to turn off virtual memory?

—Mr. Scorpio

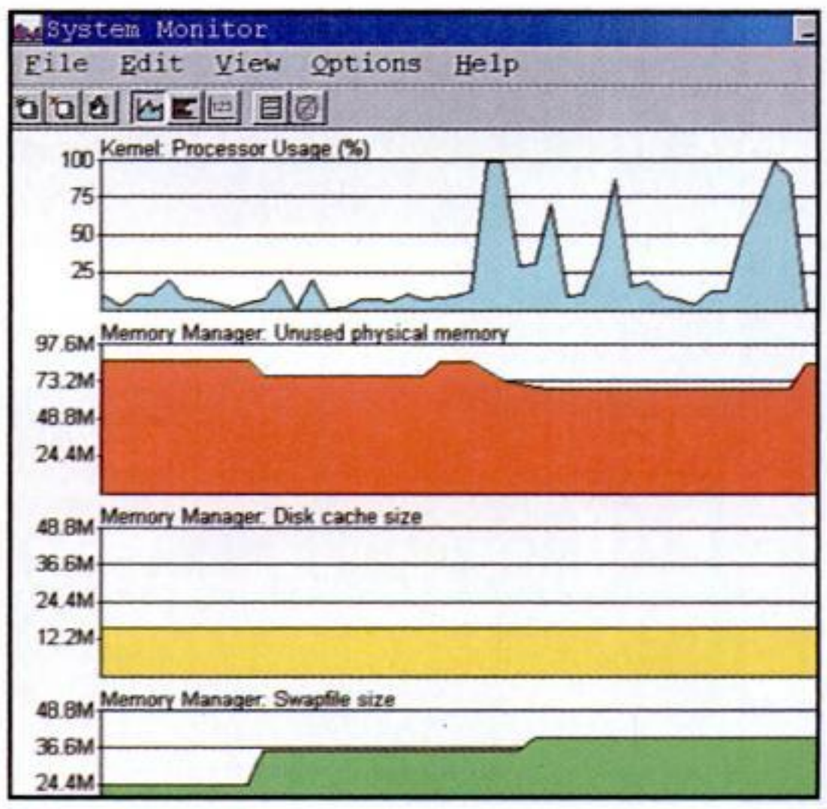
If you're running 32MB, you'll definitely see a performance boost from upping it to 64MB or 128MB. Let's face it, Windows 95/98 is a memory hog. It devours RAM faster than you add it. As soon as you install more RAM, Windows grabs it for the virtual cache. You can try muzzling Win95/98 by adding the lines: MinFileCache=XXXX and MaxFileCache=XXXX to your SYSTEM.INI under the [vcache] area. It'll help keep Windows 95 from neutralizing any RAM additions.

With 128MB of PC100 SDRAM, I was able to run my 400MHz P-II without any noticeable performance loss and with virtual memory switched off. You'll probably want to leave virtual memory switched on, though, for those times when your applications exceed your physical memory. With 128MB, Windows shouldn't hit the hard drive too much.

Leaky Windows

Whenever I run my PC for any length of time, I can actually feel it slow down. When I look at my System Properties dialog and click on the Performance tab, I see that I usually boot up with about 85 percent of system resources free. About an hour later, its down to about 60 percent, any longer and it drops below 50 percent and is practically unusable, demanding a reboot. I run many programs simultaneously, such as several browser windows, *Winamp*, sometimes a graphics app, but does this sound normal?

—Justin Boates



After muzzling Windows' voracious appetite for a large disk cache, you can use System Monitor to observe the benefits.

This month THE DOCTOR looks at:

- **Overclocking your friends**
- **Short-term Windows memory loss**
- **A: drive options**
- **TCP/IP and you**

and more...

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Yes, this is normal for Windows, and it's commonly referred to as "memory leak." Windows 95/98 doesn't dynamically allocate memory for its apps, instead opting for the app itself to determine its needs and then free up the memory it used when the app closes. Memory leaking occurs when an app fails to close out all the system resources it used. Sometimes Windows 98 itself is responsible for its own memory leakage. My suggestion is to look for the latest versions of your applications or patches that may have fixed problems. A fresh reload of the operating system couldn't hurt either.

A Super Floppy Alternative

I recently purchase the Imation SuperDisk überfloppy with the intention of getting rid of my nasty floppy drive. I have an Abit BX6 motherboard with the Award PG-451 BIOS, which supposedly allows the SuperDisk to be a bootable drive. I went into the BIOS and turned off my A: and B: drives, but I couldn't find an option to make my SuperDisk the A: drive. I figured since the floppy was gone, my system would boot with the SuperDisk, but to my chagrin, my SuperDisk is my D: drive and the floppy (which isn't even installed on my system) shows up as the A: drive. Do I need a bios update?

—Nick Nagrani

Double check your settings first by re-enabling the floppy drive in the PCI and Onboard I/O Setup portion of the BIOS. Then head over to the BIOS Features Setup and change the Boot Sequence setting to LS/ZIP, C. If you're unable to find an option to boot to your LS-120, then you should look into updating your BIOS.

Just remember to check the README and follow the instructions prior to updating your BIOS, because if you end up hosing it, you're out of luck. Also, after updating the BIOS, you'll need to go back in and change the above settings again, along with any others you've change before.

"Let's face it, Windows is a memory hog. It devours RAM faster than you add it."

```
CPU L2 Cache ECC Checking   : Enabled
Quick Power On Self Test    : Enabled
Boot Sequence               : LS/ZIP,C
Swap Floppy Drive           : Disabled
Boot Up Floppy Seek         : Disabled
```

The setting above should make your LS-120 drive the new drive A:.

TCP/IP: The Other Protocol

Is there a simple way (without having to set up an NT server) that we can play TCP/IP games inexpensively at home? Older games usually used IPX connections, yet most of the newer games use TCP/IP only.

—Cofrezi

Since the Internet has made it so popular, TCP/IP seems to be the multiplayer protocol of choice for all the latest games. It's relatively easy to set up TCP/IP on your machine for home networking. Just open your Network Properties and add TCP/IP from the list of Microsoft protocols. Windows will ask you for your Win95/98 disc and make you restart before you set it up.

If you have multiple TCP/IP settings (one for your network card and one for Dial-Up Networking), select the one that's linked to your network card. In the Properties screen, add the address 192.168.1.1 in the IP Address box. Now add 255.255.255.0 in the Subnet Mask box. Now do this for all your machines and increment the last number of the IP Address so that each machine has a different one. These addresses are considered reserved and will not be published across the Internet (so they won't interfere when you're connected via modem and surfing).

NOTE: Some games such as *Half-Life* will automatically dial your modem and try connecting to your ISP. To disable this, open the Internet icon in the Control Panel, select the Connections tab, and remove the check from the box labeled Dial the default connection when needed. Now your machine will connect only when you tell it to.

overclocker's CORNER

Celeron Wishes and Overclocking Dreams

I was looking into getting a new 450MHz Pentium II system when a salesman told me I could save money by overclocking a Celeron 300A. Would I get the same performance out of the overclocked chip?

—Michael Rue

If you overclocked a Celeron 300A to 450MHz, you would indeed get performance similar to that of a 450MHz Pentium II, but you also run the risk of reducing your Celeron's life span. Any time you overclock a processor, the excessive heat generated by running the CPU above spec results in added wear and tear on the circuits. Since the Pentium II boasts 512K of L2 cache running at half the processor speed and the Celeron has 128K of L2 cache running at full processor speed, you shouldn't notice a huge performance difference between the two after overclocking. Just make sure to outfit the 300A with active cooling devices, such as a burly fan and heatsink combo, or your overclocking dreams will quickly turn to system crashing nightmares.

High-Speed Side Effects

Will overclocking my system at 75MHz or 85MHz have any detrimental effects on my hard drives? I know some peripherals don't work well with higher bus speeds, but I haven't heard of any problems with hard drives. I'm running a 233MHz Pentium II overclocked to 300 (75MHz x 4.5) on an Abit LX6 using Win98. Using HD Tach, my 4GB Western Digital Caviar is showing 16MB/sec and a random-access time of 18.6ms. The random access time seems high. Has a year of overclocking taken a toll on my hard drive?

—Jack Frost

No. The EIDE/Ultra DMA bus runs separate from the front-side bus, which connects the CPU to main memory (RAM), the system chipset, PCI devices, the AGP card, and other peripheral buses. I don't know of any way this would affect your hard drive. Your throughput is great, although we agree that the random access time is slow. Is DMA enabled? If not, your CPU is working overtime. To enable it, open your Device Manager and check the DMA box in the settings tab of your hard drive's properties. Reboot and rebenchmark.

Also, try enabling IDE HDD Block Mode in your BIOS (located in the BIOS FEATURES SETUP) for multisector transfers, which your drive should support.

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3D

HARDWARE ON THE HORIZON AND SOFTWARE SOON TO SHIP

- Voodoo³ 64
- System Shock 65

3Dfx's Voodoo³

Fast as fast can

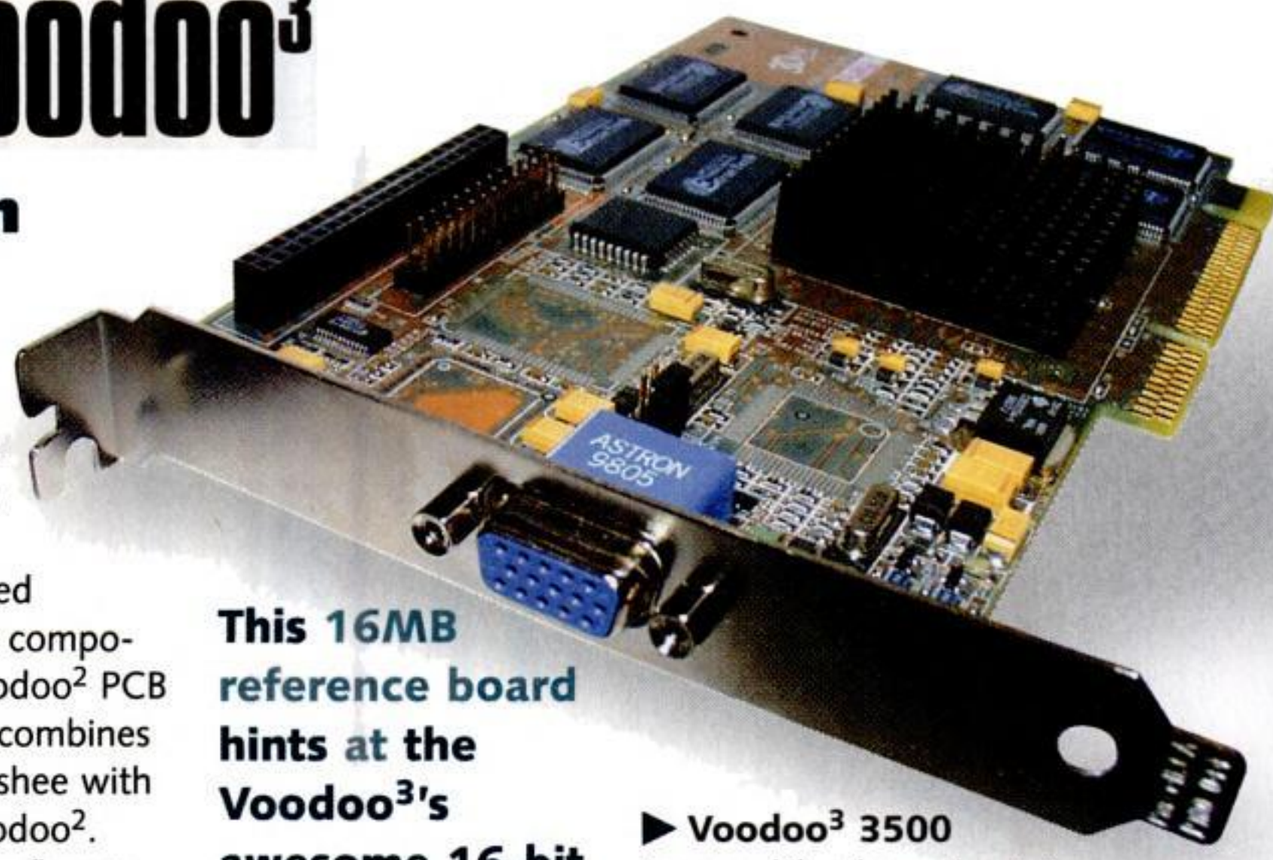
3Dfx's next-generation 3D accelerator promises everything you could want from the Voodoo architecture. But we're left wondering if it's enough to defend the title of 3D champ.

The Voodoo³ is an integrated 2D/3D chip—all those distinct component chips that graced the Voodoo² PCB landscape are banished—that combines the 128-bit 2D aspects of Banshee with the dual texturing units of Voodoo².

3Dfx's latest will come in four flavors.

▶ **Voodoo³ 2000** will be the entry-level version. Two barebones PCI 2.1/AGP 2x versions with two sub-variants will appear: a 125MHz motherboard version and a 143MHz videocard solution. Expect a 300MHz RAMDAC. The motherboard component will be made available to all mainboard makers. STB plans on producing a motherboard, as well.

▶ **Voodoo³ 3000** will be the mainstream chip. With a core clocking in at 166MHz, the boards will come with 16MB of local memory and will most likely include TV outs. Expect a 350MHz RAMDAC.



This 16MB reference board hints at the Voodoo³'s awesome 16-bit rendering power. But is it enough?

▶ **Voodoo³ 3500** is geared for the enthusiast. Clocking in at 183MHz, this 16MB board will come with TV and Digital Flatpanel Display (DFP) outputs. Expect a 350MHz RAMDAC. An AGP 4x version will be available around the time of Intel's Camino chipset release.

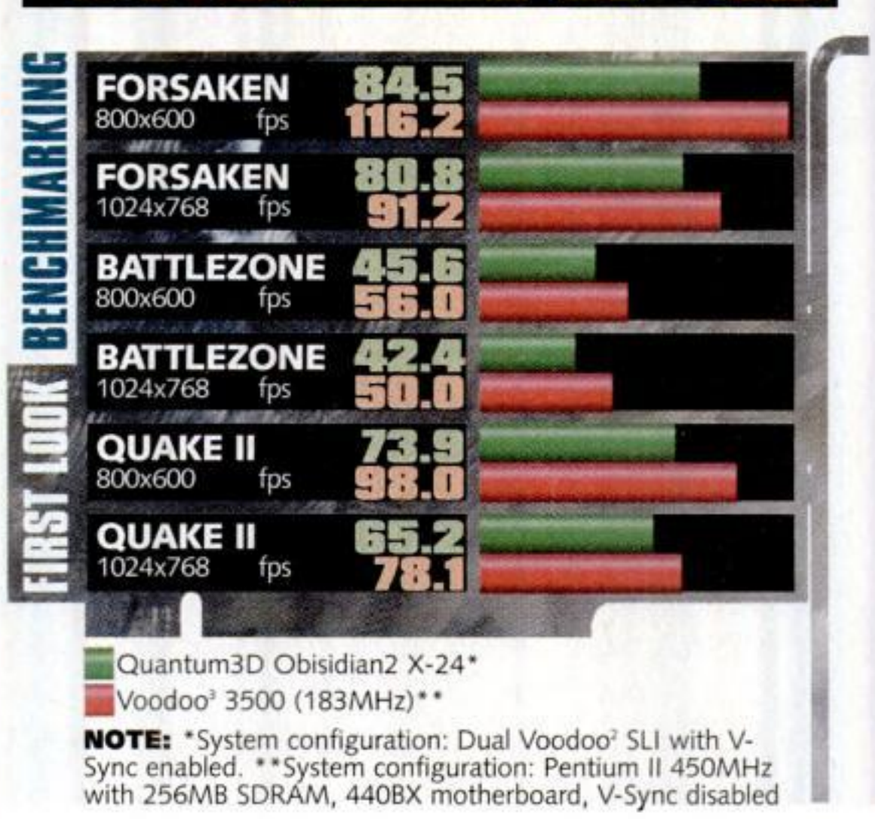
All four Voodoo³ flavors will share many specs:

▶ 0.25-micron process for faster processors
▶ dual pipeline for single-cycle multitexturing
▶ PCI 2.1 or AGP 2x with sidebands, but no Direct Memory Execution (DME)
▶ support for 4MB to 16MB of SGRAM/SDRAM (16MB only) frame-buffer
▶ 32-bit internal rendering, but 16-bit final rendering output and z-buffer accuracy
▶ 256x256-pixel texture-resolution support
▶ support for trilinear mip-mapping and bump-mapping (embossed method)
▶ 16-bit 3D rendering output up to 1920x1440
▶ DVD-hardware-assisted video acceleration
▶ Direct3D, OpenGL (via ICD and miniGL), and Glide 2x/3x support

We took an early 3Dfx Voodoo³ reference board around the block, and the results show that Voodoo³ is a powerful 16-bit renderer. Easily matching the rendering prowess of a dual-Voodoo² SLI configuration, Voodoo³ looks excellent with today's applications. But 16-bit rendering is going to look dated, with high-profile games such as *Quake III Arena* moving in the 24-bit palette and 512x512-texture resolution realm. Rendering quality is clean, with all visual effects in place. Dithering patterns appear in alpha-blends, but they've always existed with the Voodoo architecture.

By downplaying essential next-gen features, 3Dfx may win in the speed department, but it may look bad doing it.

—Andrew Sanchez


FIRST LOOK BENCHMARKING
FORSAKEN 800x600 fps 84.5 116.2
FORSAKEN 1024x768 fps 80.8 91.2
BATTLEZONE 800x600 fps 45.6 56.0
BATTLEZONE 1024x768 fps 42.4 50.0
QUAKE II 800x600 fps 73.9 98.0
QUAKE II 1024x768 fps 65.2 78.1
Quantum3D Obisidian2 X-24*
Voodoo³ 3500 (183MHz)**

NOTE: *System configuration: Dual Voodoo² SLI with V-Sync enabled. **System configuration: Pentium II 450MHz with 256MB SDRAM, 440BX motherboard, V-Sync disabled

PRODUCT AVAILABLE

Price $200 for a 16MB board
Company 3Dfx
URL www.3dfx.com

Q2.99

For definitions of Terminator words, hyperlink to the back of Maximum PC, or check out the Terminator online at www.maximumpc.com.

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System Shock 2

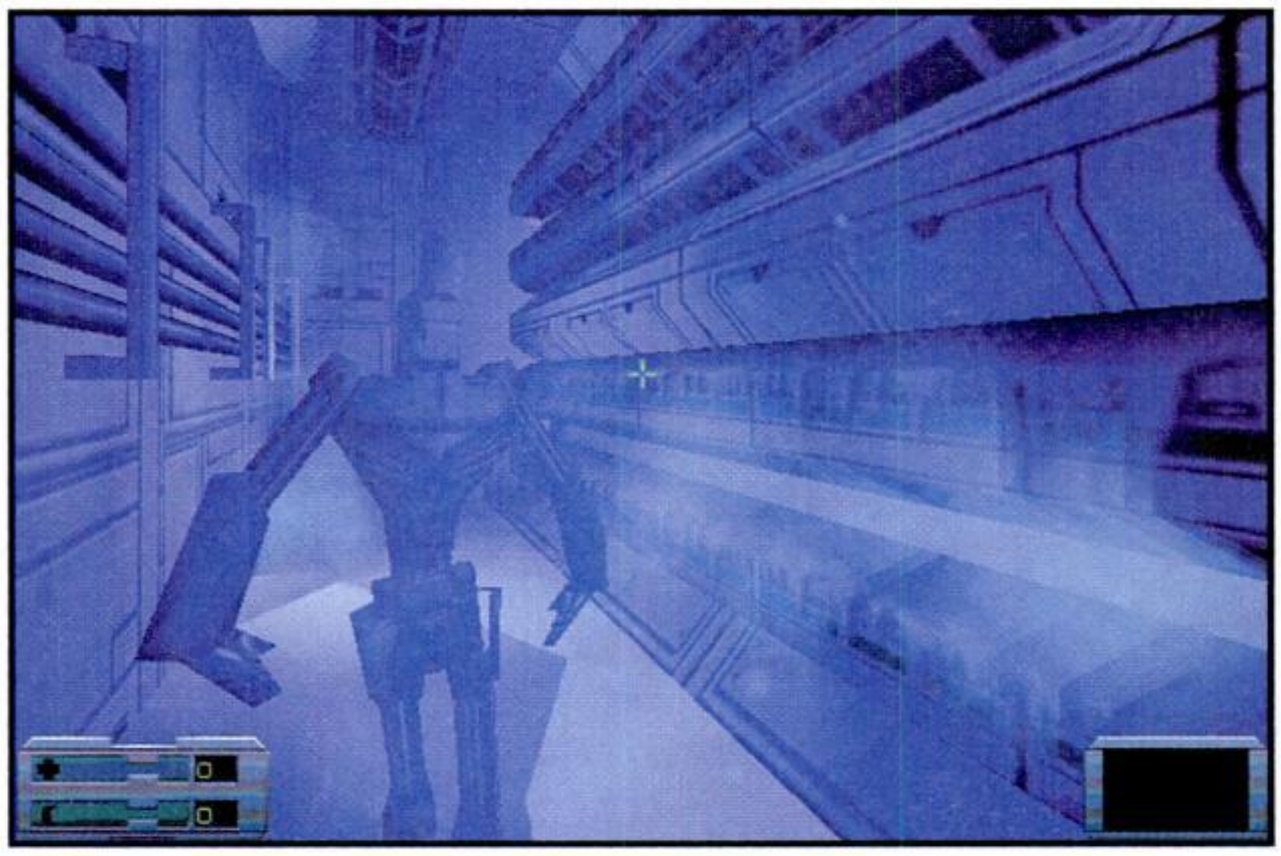
One of the best RPGs gets better

The starship "Von Braun" is a deserted space hulk, and it's up to you, with your fancy cybernetic implants, to find what went wrong.

Welcome to *System Shock 2*, the RPG sequel to one of most acclaimed, yet underplayed games of all time. Taking the Dark engine that powered *Thief* to new heights, *System Shock 2* promises pure role-playing action via its first-person point-of-view.

Ken Levine, lead designer from Irrational Games, takes us into *System Shock 2*'s dark future.

—Andrew Sanchez



Maximum PC Will System Shock 2 be a hardcore RPG using a first-person engine or a lame first-person action game with RPG elements?

Levine *System Shock 2*'s RPG depth is on par with *Ultima Underworld* and *Daggerfall*, and significantly richer than *Diablo*.

Maximum PC You've compared the character generator for Shock 2 to the pen-and-paper RPG Traveller.

Levine The character chooses from three branches of the military: the weapons- skills-focused Marines; the technically proficient space-borne Navy; and the secret black ops division, the OSA, which focuses on psi-powers. The character goes through four years of military service, choosing a yearly "mission" that is resolved through a debriefing where the player is informed of his character's growth. The character grows as he pleases and chooses what kind of character he wants to become. It allows the player either to specialize or become a jack-of-all-trades.

Maximum PC Shock 2 won't devolve into a "find the key to get to the next level" game, will it?

Levine Because the game design has to tell the story (through logs, e-mails, AVIs, in-engine cutscenes, apparitions, etc.), we can support a much more detailed level of quest design and interaction. Most of the player's interactions are very technically oriented. The player will be getting ship's systems back on line, introducing toxic elements into air-recirculation units, clearing radiation out of faulty coolant tubes, and the like. Mini-quests come in unique forms, such as researching mysterious artifacts to gain information (such as weaknesses or strengths of opponents) or useful tools or weapons.

Unlike Half-Life, System Shock 2 is a free-wheeling, exploratory, "on your own" type of game.

Maximum PC How much NPC interaction will there be?

Levine We chose not to have NPCs who follow you around, but party members can join you in co-op multiplay. *Shock* is really about loneliness, isolation, and terror. We thought incorporating them would detract.

Maximum PC What optimizations have been made to the Thief/Dark engine?

Levine Improvements include 16-bit color, colored lighting, support for high resolutions, variable translucency objects, as well as all the game-specific *Shock* things, such as the interface, new AI, larger monsters, and so forth. The engine can support arbitrary texture resolutions, in powers of 2. However, we are not engine-bound by any texture size.

Maximum PC A complaint regarding Thief was the low-polygon count models. Will Shock 2's beasties be heftier?

Levine *Shock 2* has a number of methods for dealing with poly counts. One is the brain-dead solution of having a very high-poly monster in a sealed-off area where you know you won't run into any other monsters. The other solution is to populate areas of levels with mostly middle-poly (numerous) foes and hope you don't get too many. Then we have a bunch of both low-poly and low-AI overhead monsters who exhibit more animal behaviors.

Watch out for patrolling creatures and dynamically spawned monsters.

PRODUCT AVAILABLE

Price TBA
Developer Looking Glass Studios/Irrational Games
Publisher Electronic Arts
Phone 617.441.6333
URL www.lglass.com

06.99

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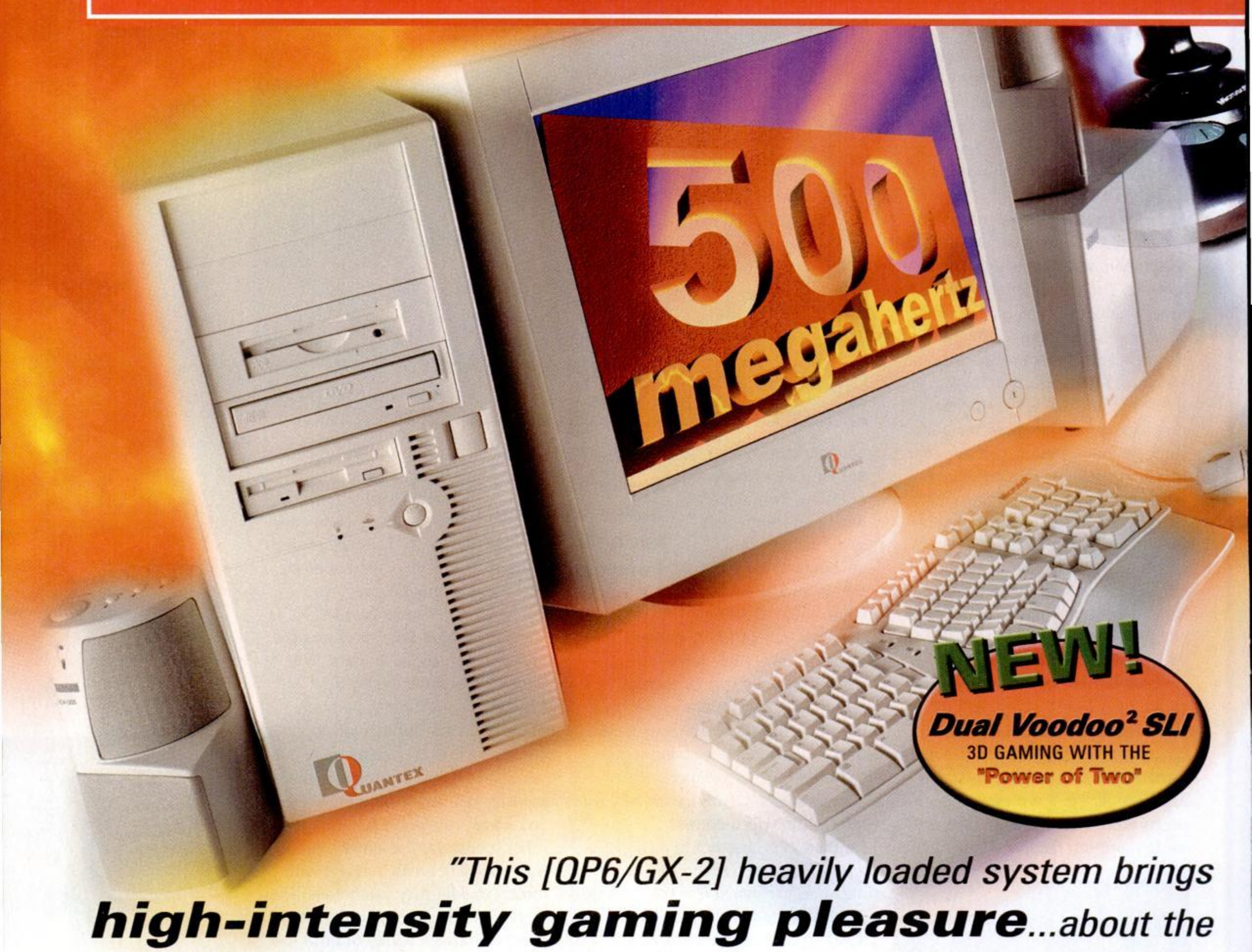

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intel inside
pentium III processor

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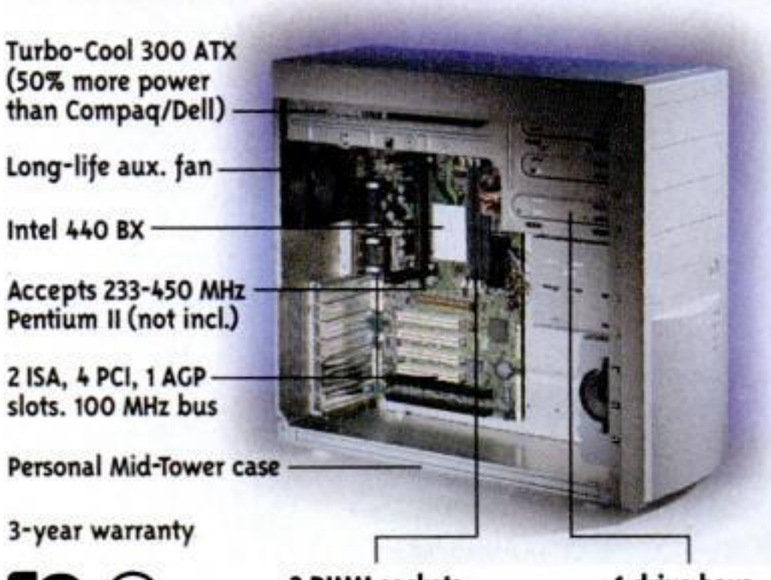
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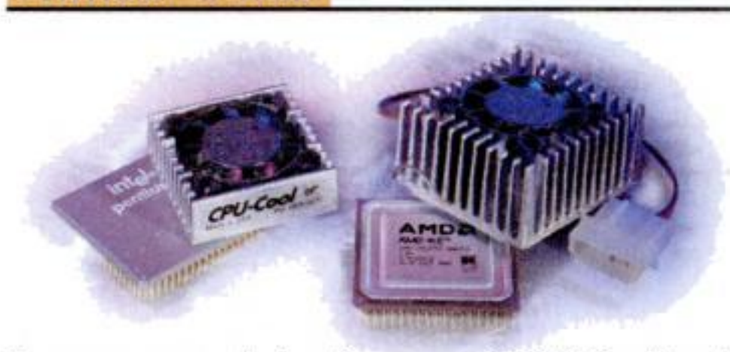

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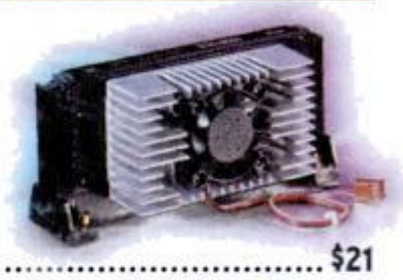

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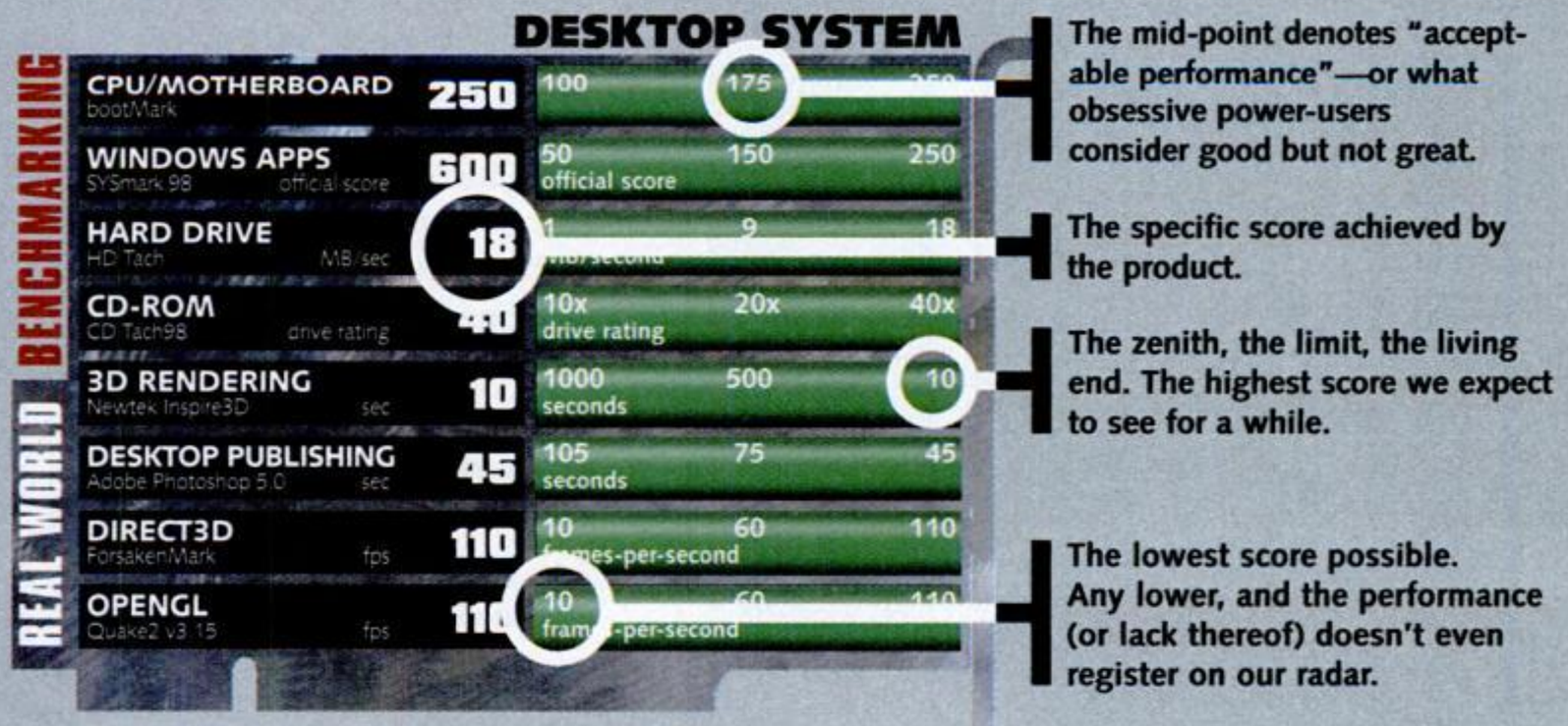
Testing Policy

Our product evaluation process is built on down-and-dirty, hands-on testing. All hardware benchmarking is conducted in the Maximum PC lab by Maximum PC editors, and, whenever possible, we use real-world applications to gauge performance. Our final verdicts are based on benchmark results and a subjective appraisal of product features.

EDITOR'S CHOICE AWARD:
Only 9 and 10 verdicts are even eligible for the coveted Kick Ass award, the mark of PC excellence.

Online Guide to Benchmarking

Go to **www.maximumpc.com/benchmarking/benchmarking.html** for the complete explanation of *Maximum PC*'s benchmarking policies.



KICKIN' THE TIRES ON THE LATEST HARDWARE AND TAKIN' THE LATEST SOFTWARE OUT FOR A SPIN

Hardware Photography by
AARON LAUER

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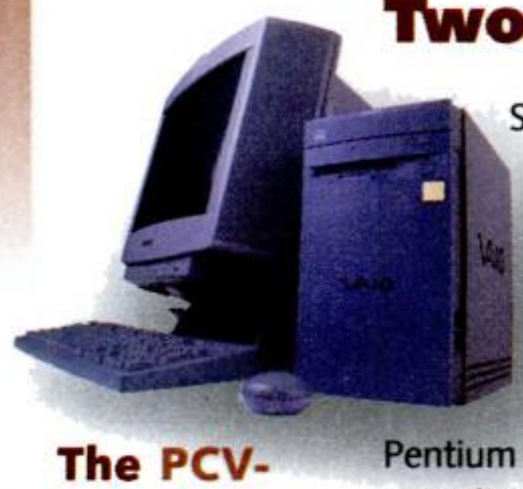
Sony VAIO PCV-E518DS

Two technological steps forward, one step back



The PCV-E518DS is a good system for interactive digital content creators.

Sony's VAIO Digital Studio was first reviewed in our December 1998 issue and garnered a solid 8. This time out, Sony's modifications—including updating the processor to a 500MHz Pentium III, increasing the hard drive capacity by more than three gigs, and swapping out the DVD for a CD-RW—make the VAIO a compelling option for digital content creators. However, while there's a lot we like about this pint-sized Tiny Mighty Moe, it's still missing key features that keep it from receiving the coveted Kick Ass award.

This system is marketed as a "Digital Studio," but its OpenGL support under Windows 98 is limited. Matrox's G200 chip on the motherboard delivers incredible 2D, but its 3D capabilities lag behind nVidia's TNT. To get the most out of OGL animation applications, you'll need Windows NT, which takes advantage of Matrox's MCD (Mini Client Driver).

Ideally, today's Digital Studio would also have a DVD-RAM or DVD +RW drive inside, because the future of digital video rests with MPEG-2. However, because Sony would rather die than OEM a competing hardware spec (and DVD +RWs aren't shipping yet), we're left instead with a Spressa CD-RW. The Spressa is a killer drive in its own right, scoring a 9 in our February issue, but 650MB are not enough for most digital producers.

PLUSES

- Lightweight
- Easily transportable
- IEEE 1394 ports
- Generous software bundle
- Sharp Trinitron monitor
- 800 tech-support number

MINUSES

- Lacking CD-mastering application such as EZ CD Creator
- Limited expansion bays
- No full-length PCI slots
- One free PCI slot
- No DVD

Performance-wise, the 500MHz VAIO beat the 450MHZ VAIO we reviewed in December 98 in every test except ForsakenMark. In the bootMark test, the 500MHz VAIO came in with a solid 233, where the 450MHz received a 189. In SYSmark 98, the 500 got a 202, where the 450 got a 147. The CD-ROM drive was faster by a full 12x because Sony swapped the DVD for a CD-RW. In *Inspire*, which is incredibly floating-point intensive, the 500 rendered a ray-traced 640x480 image in 437 seconds, shaving 1:13 from the 450. The 500 also shaved 15 seconds off our *Photoshop 5.0* test.

When compared to three other 500MHz P-III systems with similar specs (a Dell, Compaq, and Micron reviewed in the March issue), the VAIO's performance placed in the middle. It tied for first place with Dell and Micron in the *Inspire* benchmark; came in second place in SYSmark with a 202 (against Micron's 204) and in the *Photoshop* benchmark with 60 seconds (behind Micron's 59 seconds); and came in third place in the bootMark (233.8), trailing both Dell (241.06) and Micron (239.62). Where Sony ranked the lowest was in 3D gameplay and framerates, which are limited by Matrox's G200 chip. Under our Direct3D test, the VAIO scored 64.4fps, where the other contenders scored over 100fps. And likewise in the OpenGL test, the VAIO topped out at 26.4fps while the others scored 60fps and higher.

The Sony Digital Studio is a good machine and has one of the smallest formfactors we've seen (which means a dearth of open drive bays.

But to earn a Kick Ass in the future, Sony should include hardware MPEG-2 playback, a software MPEG-2 encoder, and some type of DVD writable drive—even if it means charging a little more for the box.

—Rick Popko

UNDER THE HOOD

THE BRAINS

CPU	Intel Pentium III 500MHz
L2 Cache	512K
RAM	128MB 100MHz SDRAM (upgradable to 256MB)
Motherboard	Micro ATX
Drive Bays	One 5.25-inch (occupied), three 3.5-inch bays (two occupied)
I/O ports	Two USB, two PS/2, three IEEE 1394, one serial, one parallel, Control A

DISPLAY

Video	Matrox G200 with 8MB SDRAM
Monitor	17-inch (16-inch viewable) Trinitron 0.25-mm aperture grille
Res/Refresh	1280x1024/60Hz@32-bit

STORAGE

Hard Drive	Maxtor 91728D8 17.28GB UDMA
CD/DVD	Sony Spressa CRX100E/CH CD-R/RW
Removable	Floppy, CD-RW
Fax/Modem	56K V.90

SOUND

Sound	Aureal 32-bit PCI Wavetable Vortex (on motherboard)
Speakers	Built into monitor

OTHERS

Multifunction keyboard

THE BUNDLE

Adobe Premiere | Adobe PhotoDeluxe | Microsoft Works | Intuit Quicken Basic 99 | Microsoft Encarta 99 | Microsoft Money 99 | MotorHead | Microsoft Outlook 98 | Adaptec DirectCD

BOOT 1:13 DOWN 0:02

REAL WORLD BENCHMARKING

CPU/MOTHERBOARD bootMark		234
WINDOWS APPS SYSmark 98	official score	202
HARD DRIVE HD Tach	MB/sec	14.5
CD-ROM CD Tach98	drive rating	16x
3D RENDERING Newtek Inspire3D	sec	437
DESKTOP PUBLISHING Adobe Photoshop 5.0	sec	60
DIRECT3D ForsakenMark	fps	64.4
OPENGL Quake2 v3.15	fps	26.4

MAXIMUM PC VERDICT

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8

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EXPANSION NOTES

The VAIO Digital Studio's small formfactor limits expansion, but motherboard-bound audio and graphics help. There is room for one more 3.5-inch hard drive inside the box—and that's it. There are no free front bays for either a Zip or a Jaz, so for internal backup, you'll have to rely solely on the CD-RW.

EXPANSION MAP

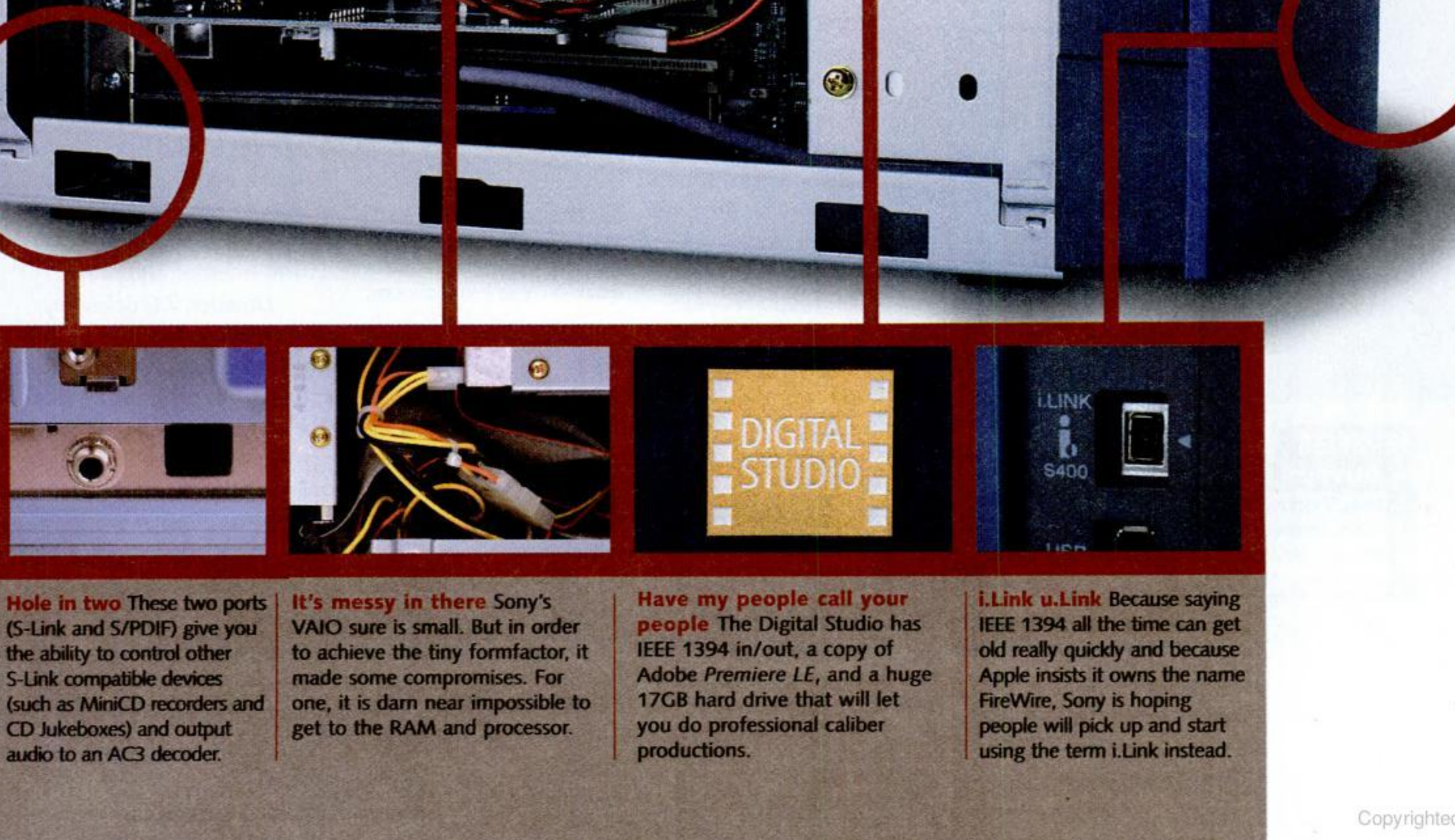
PCI	S-Link (Control A1)
PCI	Free
PCI	IEEE 1394 (i.Link)
PCI	56K V.90 Modem

IRQS

00 System Timer	09 IRQ Holder
01 Keyboard	10 IRQ Holder
02 EISA Controller	10 Modem
03 COM 2	10 Audio
04 COM 1	11 IRQ Holder
05 Audio	11 Matrox G200
06 Floppy	12 Mouse
07 Printer	13 Data Processor
08 CMOS Clock	14 IDE Controller
09 IRQ Holder	15 IDE Controller
09 1394 Controller	15 Secondary IDE
09 USB Controller	

DMAS

01 Audio	03 Audio
02 Floppy	04 DMA Controller



Hole in two These two ports (S-Link and S/PDIF) give you the ability to control other S-Link compatible devices (such as MiniCD recorders and CD Jukeboxes) and output audio to an AC3 decoder.

It's messy in there Sony's VAIO sure is small. But in order to achieve the tiny formfactor, it made some compromises. For one, it is darn near impossible to get to the RAM and processor.

Have my people call your people The Digital Studio has IEEE 1394 in/out, a copy of Adobe *Premiere LE*, and a huge 17GB hard drive that will let you do professional caliber productions.

i.Link u.Link Because saying IEEE 1394 all the time can get old really quickly and because Apple insists it owns the name FireWire, Sony is hoping people will pick up and start using the term i.Link instead.

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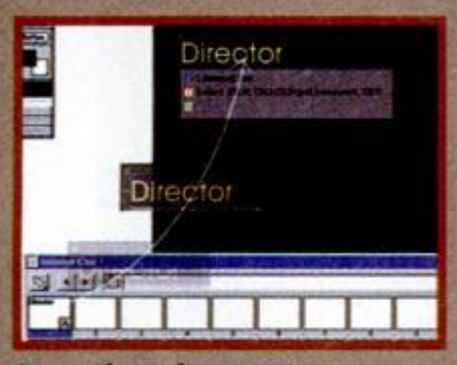
ANIMATE A LOGO

Animating within *Director 7* can now be done in six easy steps.

- **Step 1:** Create a Text cast member "director".
- **Step 2:** Drag cast member to upper left of stage.



Drag the "director" cast member from the Cast Window to upper left of stage.

- **Step 3:** Insert keyframe at frame 30.
- **Step 4:** At frame 30 move "director" to lower right
- **Step 5:** Type "360" in Score Window

Insert keyframe at frame 30 and type "360" in rotation box.

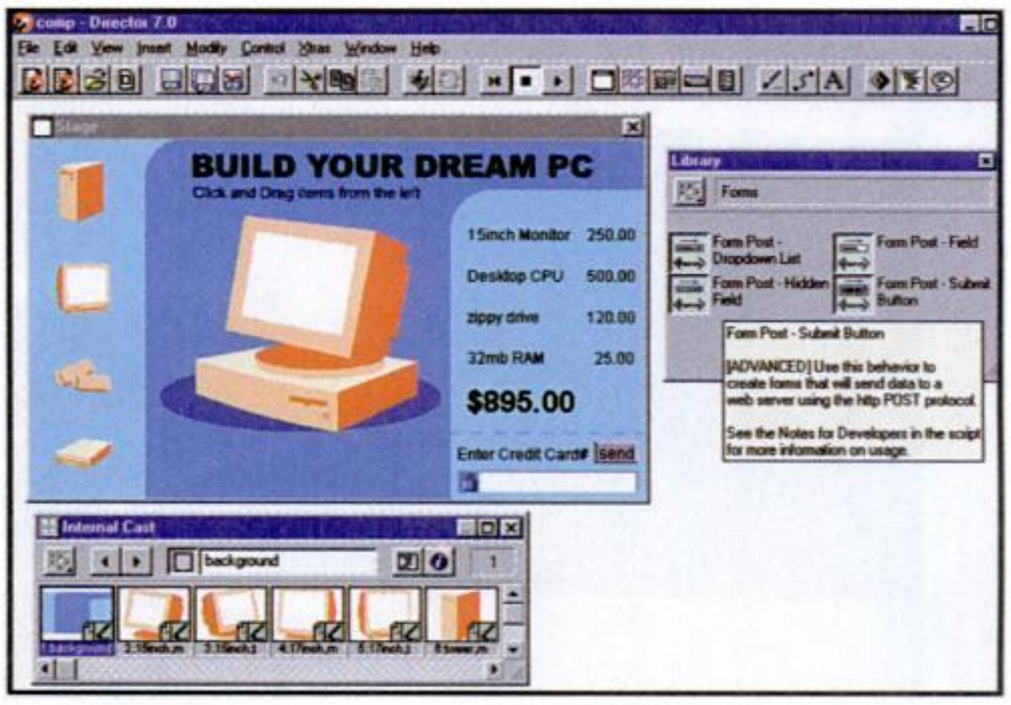
- **Step 6:** Save and compact the animation.

Director text rotates 360 degrees about its origin.

Check out the **Re:Print** section on **maximumpc.com** to see the animation in action.

Director 7

CD-ROM is dead! Long live the web!



If Macromedia hadn't seen the interactive tides moving from CD-ROM to the Internet two years ago, the company wouldn't be alive today.

After two years of forgettable baby steps, the once ubiquitous authoring app appears to have finally realized the transition to the online realm. In fact, there's so much web goodness inside version 7—including *Shockwave 7*, *Fireworks*, and Sonic Foundry's *SoundForgeXP*, Macromedia named this latest upgrade *Intenet Studio*.

Among its improvements is the new Behavior Library, which provides a convenient on-screen collection of pre-packaged behaviors allowing drag-and-drop authoring of common routines—but don't expect much sophistication from them. On the other hand, they eliminate the need to write Lingo code, which is a major time saver.

With Director 7, you get all kinds of Internet behaviors, such as interactive forms.

Experienced Lingo coders have a new syntax to learn: "dot" style (e.g., object.property). It's like JavaScript and Java, and very unlike Lingo's former C/C++ syntax. If you use JavaScript frequently, you'll find it faster and more compact. If you're a C/C++ maven, learning a new paradigm will cost you time. All scripts are now color-coded to clarify structure.

Previously, *Director* simply didn't support transparency and anti-aliasing or rotation/skewing/distortion at a level finer than a bounding rectangle. Version 7.0 changes all that. Alpha channels now allow subtle blending to captivate the viewer. Vector shapes can now be morphed in realtime by moving each vertex and its control points independently. Organic movement results in life-like realism with low overhead. Complex Lingo coding is no longer required.

PLUSES

- Drag-n-drop interface for easy authoring
- "Shocked" fonts for graphical control
- Rich graphic creation tools
- Forward-looking Internet protocol support

MINUSES

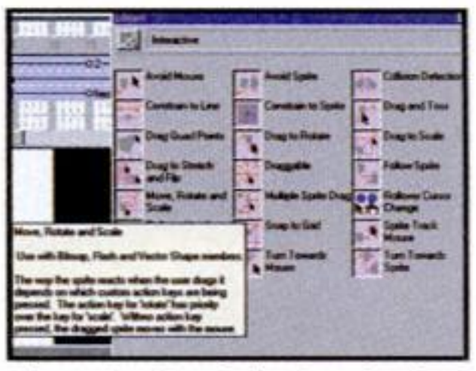
- Some Lingo structures fail
- Aftershock failed to generate proper HTML code
- Shockwave and Internet authoring inadequately documented

Director's text and font capabilities have also been greatly improved. All text is now editable, so tedious deletion and recreation is a thing of the past. And *Director*'s new "Shocked Fonts" are portable, so the end user doesn't need to install them locally.

Director 7.0 now supports Flash 3.0's new transparency, object-morphing, and animated-button capabilities. A low-bandwidth Flash animation can be integrated into the *Director* presentation, providing rich button behavior and stunning morphing effects at small overhead.

But *Director 7.0* still writes code that fails on occasion. During testing, a file with button-rollover behaviors and a QuickTime movie had mysterious disappearing buttons when the movie was added. The movie played in authoring mode, but not from the server. The background color of the *Shockwave* movie could only be changed to that of the web page by manually typing the HTML code in Notepad. *Aftershock*'s code didn't work. What a pain!

Finally, the documentation gives only the very basics of Internet authoring. One is forced to go online to the *Director* Developer's Center and sift through hundreds of white papers and user queries to find help. This situation is intolerable. Macromedia needs comprehensive documentation covering *Shockwave* and Internet authoring.



The animation behaviors in the Behavior Library are explained extensively in help balloons.

Director 7.0 definitely gives the novice and experienced multimedia developer the tools to create rich and compelling presentations. If you want to progress beyond basic point-and-click navigation (i.e., "page flippers"), however, be prepared to invest considerable time learning, testing, and developing workarounds, especially for Internet work.

—Rick Stevens

THE SPECS

OUTPUT SUPPORT

Java, Shockwave (DCR), Flash, Protected (DXR), Bitmaps (BMP), AVI, QuickTime

MAXIMUM PC VERDICT

Price $449 upgrade, $999 full
Company Macromedia
Phone 800.457.1774
URL www.macromedia.com

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For definitions of Terminator words, hyperlink to the back of Maximum PC, or check out the Terminator online at www.maximumpc.com.

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Compaq Presario 1900

A notebook with a twist

The 366MHz mobile Pentium II–equipped Presario 1900 is nicknamed the "wedge" because it ships with a wedge-shaped pseudo docking station—sans extra ports and connectors—that houses the 2x DVD-ROM and floppy drive.

Think portability. With the wedge detached, the overall carrying weight drops from 7.25 lbs (including the power brick) to a relaxing five pounds. Even better, Compaq engineers have worked their magic with the wedge design—it's angled, giving the entire notebook a noticeable lift when attached, resulting in a more natural, ergonomic typing position. Adding to the comfort level is the placement of the trackpad. While other vendors strive to keep notebooks symmetrical, Compaq has placed the pad slightly to the left. While this sounds simple on paper, we were surprised to discover the enormous impact it provides. Typing felt more natural, our hands were less fatigued, and there was plenty of space to rest our wrists without fear of muffling the JBL front-mounted speakers.

If that weren't enough, Compaq has also sprayed the unit with a special "Soft Touch" paint (it's blended with an elastomer) that to the human hand feels remarkably like rubber. If this sounds too weird for words, go to the store and check it out for yourself. The "no-slip-grip" effect is simply astounding and had us all "ga-ga" within seconds.

But this Presario isn't just about aesthetics or ergonomics—it's also about performance. In the core system benchmarks, the 1900 fared extremely well, but slightly slower than the similarly equipped WinBook XL² (reviewed in our March 1999 issue). Of note, however: the 1900's DVD-ROM drive, which posted a zippy CD-ROM drive rating of 13.7x, and hard drive, with a speedy transfer rate of 6.7MB/sec. Factor in the built-in modem, one-touch hot keys for Internet access, and additional scroll mouse buttons, and we were all set to award our coveted Kick-Ass Award.

But we won't, especially after realizing NeoMagic's MagicMedia 256AV multimedia accelerator doesn't *actually* provide hardware support for Direct3D. To its credit, Compaq's product documentation only claims "higher performance 3D graphics," but NeoMagic's web site is extremely misleading and shameful, claiming "full support for Direct3D."

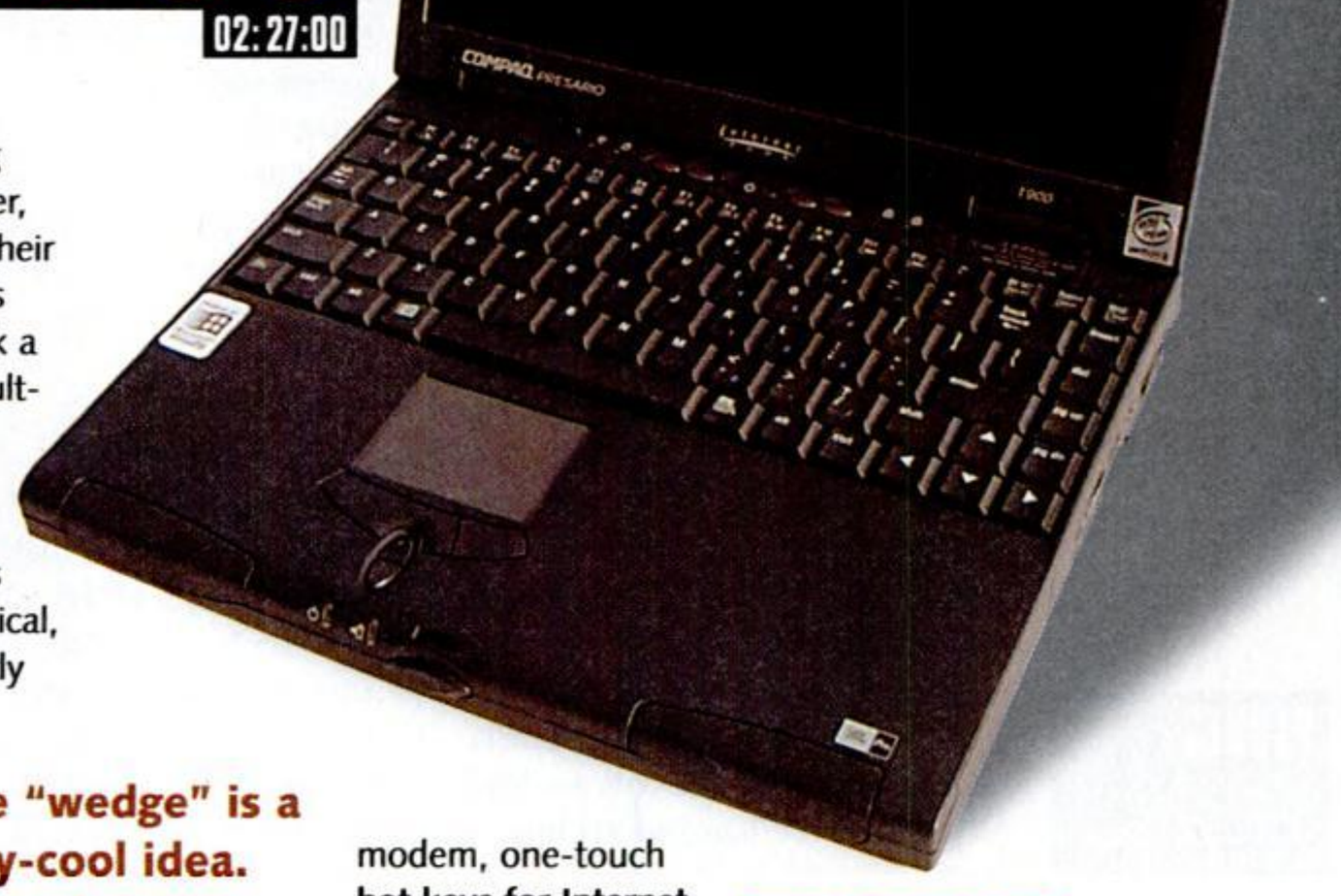
Unless Compaq decides to swap out the video subsystem, we can't possibly recommend it for anyone with serious multimedia needs. And that's too bad, because with all its cool design ideas—and a price tag that's $300 less than the WinBook XL²— it could've easily been a 10.

—Bryan Del Rizzo

PLUSES
- 366MHz Pentium II
- External volume control
- Slick paint job
- Wedge implementation

MINUSES
- Single USB port
- No TV-out
- Not D3D compliant

The "wedge" is a way-cool idea. But unless you plan on watching DVD movies on a transcontinental flight, you're better off leaving it at home and traveling light.

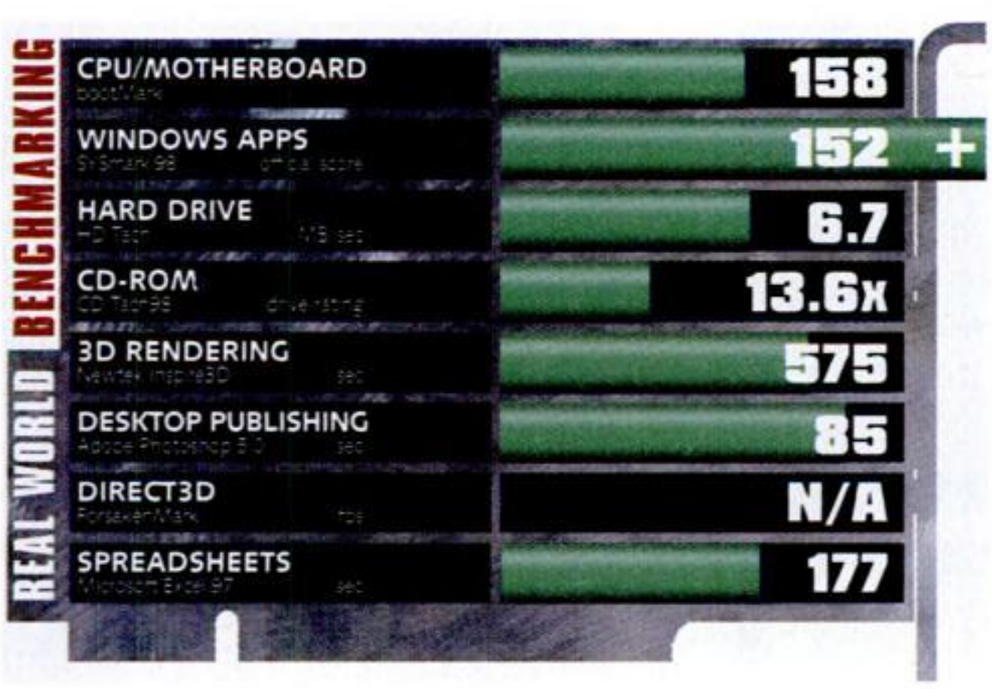


UNDER THE HOOD

THE BRAINS	
CPU	366MHz Intel mobile Pentium II
RAM	64MB SDRAM (expandable to 256MB)
I/O Ports	Dual PC card, parallel, serial, external monitor, single USB, single PS/2, IrDA, microphone-in, headphone-out
Modem	Built-in 56K V.90 modem
DISPLAY	
Videochip	NeoMagic MagicMedia 256AV AGP with 2.5MB SGRAM
Display	13.3-inch active-matrix
Res/Depth	1024x786/24-bit
STORAGE	
Hard Drive	Toshiba 6.4GB Ultra DMA
DVD-ROM	Toshiba 2x with software-assisted MPEG-2 decoder
SOUND	
Sound	NeoMagic software wavetable/FM synthesis
Speakers	Stereo speakers
TIPPING THE SCALES	
Lap Weight	5 lbs without wedge 6 lbs, 12 oz with wedge
Carry Weight	7 lbs, 4 oz

BOOT 2:10 DOWN 0:05

REAL WORLD BENCHMARKING



MAXIMUM PC VERDICT

Price $3,049
Company Compaq
Phone 800.345.1518
URL www.compaq.com

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Copyrighted material

SGI 320 Visual Workstation

A workstation ahead of itself

Proof that sometimes you can be too cutting-edge.

SGI's new Windows NT box is a year ahead its time. But this isn't necessarily a good thing.

It runs standard Windows NT, but a proprietary EPROM prevents you from loading any other OS. It supports PCI, but only the new 3-volt spec. It has two IEEE 1394 ports, but they won't work until Microsoft builds support for the spec into NT 5. It uses RAM, but SGI has gone back to interleaving technology (two banks) and half-length PCBs (12 sockets). While not necessarily faster, this strategy widens the number of lanes on the data highway, allowing more simultaneous operations.

Looking inside, the first thing you notice is how empty the box is. None of the three PCI slots are filled. All graphics are handled via the motherboard-bound proprietary Cobalt chipset, a design passed down from SGI's Unix workstations. This allows 3D apps to hijack system RAM for graphics, as opposed to card-based solutions that tap local memory. But it also means the hardware cannot be upgraded when better technology inevitably comes along. Pumping an astounding 1920x1200 in true color, the 320's 2D capabilities are truly amazing. And the 320 works with SGI's 1600SW flat panel (which got a 10/Kick Ass in our January 1999 issue) via a daughter card that can be snapped directly onto the motherboard.

The 320's OpenGL performance is good, but not better than Intergraph's GX1 dual-500MHz Xeon Wildcat system with 256MB of RAM. On the other hand, the SGI has better 2D (the GX1's 1280x1024 at 85Hz and true color pales in comparison).

In the Viewperf Awadvs-02 test, the SGI 320 came in at 22.05fps, while the GX1 more than doubled that with 52.48fps. In the DRV-05 test, the 320 came in with 14.42fps, while the GX1 could handle 16.18fps. When we ran the tests side by side, the 320 showed noticeable redraw problems in the Awadvs-02 test, e.g., towers would sputter and strobe, while the GX1 plowed through the test uneventfully.

The 320 includes gratis video-capture capabilities, and they are lackluster at best (it dropped frames at 640x480 and we struggled to get the video-out to TV). The lightweight two-piece Polk Audio speakers are meager, and the lack of large removable media is unforgivable.

Aside from middling HD Tach and CD-ROM scores, and before Intergraph's GX1 arrived at the office, the 320 was the fastest PC we had driven, but the $10,000 GX1 eclipses the 320 in just about everything except CD Tach and the *Photoshop* test. So maybe the 320 isn't so forward-looking after all.

—Rick Popko

PLUSES

- Fast 3D rendering
- Custom configurations available
- Fairly inexpensive compared to workstations in its class
- Three-year warranty
- Awesome 2D

MINUSES

- Middling speakers
- No large-size removable media
- No free 5.25-inch drive bays
- Only runs NT
- No MIDI port
- Expensive RAM

UNDER THE HOOD

THE BRAINS

CPU	Two Intel Pentium III 500MHz
L2 Cache	512K
RAM	512MB 100MHz ECC SDRAM upgradable to 1GB
Motherboard	SGI SSS320
Drive Bays	One 5.25-inch (none free), five 3.5-inch (three free)
I/O Ports	Two USB, two IEEE-1394, two COM, VGA, digital flat panel, RCA audio in/out, Composite in/out, S-Video in/out

DISPLAY

Videocard	Proprietary Cobalt on motherboard
Monitor	SGI 1600SW digital flat panel
Res/Refresh	1900x1200/66Hz@24-bit

STORAGE

Hard Drive	10GB IBM DTTA 371010 IDE (DeskStar 7,200RPM)
CD/DVD	Teac CD-532E 21x
Removable	Floppy
Fax/Modem	Intel 10/100BaseT Ethernet (on motherboard)

SOUND

Sound	Crystal CS4235 migrating to Cobalt
Speakers	Polk Audio two-piece with sub out

OTHER

Three-button mouse

THE BUNDLE

Hummingbird NFS Maestro Solo | Hummingbird InetD (telnet server) | MKS Unix file manipulation programs | Media4Productions' MacDrive98 | Equilibrium Debabelizer Pro 4.5LE

BOOT 0:56 DOWN 0:39

BENCHMARKING

REAL WORLD BENCHMARKS

		SGI 320	Integraph GX1
NT 4.0 APPS	SYSmark WinNT 4.0 official score	432	445
DESKTOP PUBLISHING	Adobe Photoshop 5.0 sec	44	47.3
HARD DRIVE	HD Tach MB/sec	10.8	16.1
CD-ROM	CD Tach98 drive rating	21.6x	20.4x
LIGHTWAVE 3D v5.5	Raytrace.lws sec	296	282
3D STUDIO MAX v2.5	Kyx_rays.max sec	206	204
VIEWPERF/OPENGL	DRV-05 Mean score fps	14.4	16.2
VIEWPERF/OPENGL	Awadvs-02 Mean score fps	22.1	52.5

MAXIMUM PC VERDICT

Price $7,205 without monitor), $9,699 with flat panel
Company Silicon Graphics Inc.
Phone: 650.960.1980
URL www.sgi.com

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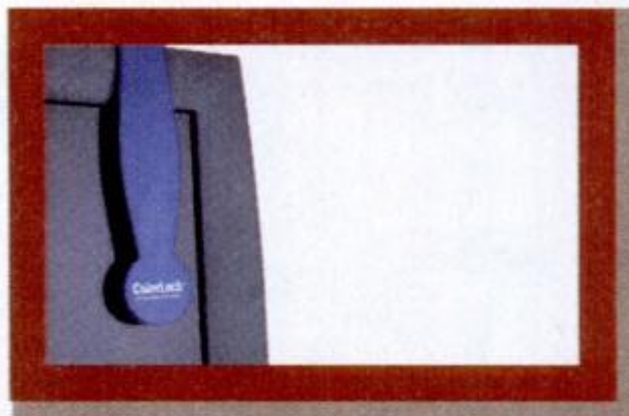


Color in the lines The ColorLock tool calibrates your flat panel's color. The included software can also send the calibrated color information over a network or the Internet to sync additional SGI flat panels.

EXPANSION NOTES

None of the PCI slots and are filled; however, only cards that support the new 3-volt specification will work in them. You get three free 3.5-inch drive bays, but no free 5.25-inch drives.

EXPANSION MAP

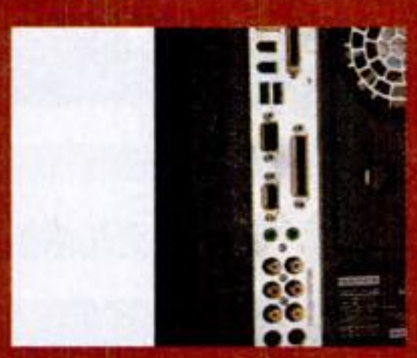
PCI	Free
PCI	Free
PCI	Free

IROS

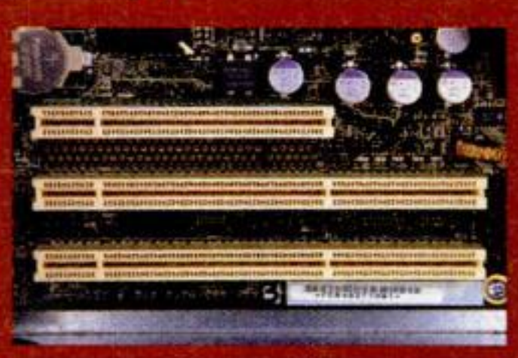
02 Floppy	09 Cwbaudio
04 Serial	14 Atapi
05 Cwbaudio	15 Atapi
06 Floppy	

DMAS

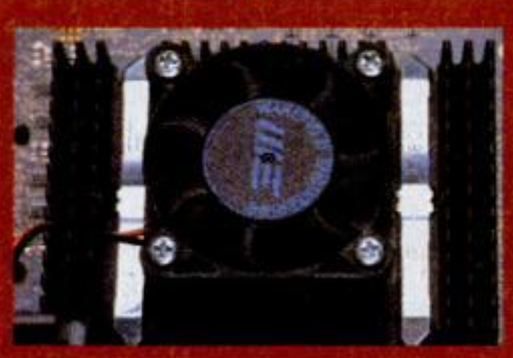
00 Cwbaudio	02 Floppy
01 Cwbaudio	



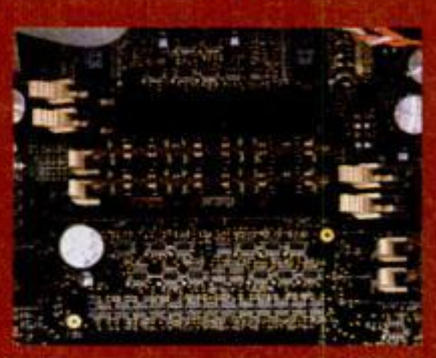
Port-o-rama The 320's 1394 ports will remain inactive until Microsoft ships NT 5. The system also includes composite video and RCA audio in/out.



Slot me, baby The 320 has three PCI slots, none of which are filled, but keep in mind these babies only support the new 3-volt PCI spec.



Be cool The built-in Cobalt core-logic chipset handles so much—including 2D and 3D—it needs its own fan and heatsink to stay cool.



SIMMply Unusual SGI's gone back to using half-length SIMMs, which requires memory to be installed in pairs, an expensive, proprietary proposition.

For definitions of Terminator words, hyperlink to the back of Maximum PC, or check out the Terminator online at www.maximumpc.com.

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USB Modems are Finally Here

But can they keep up with traffic?

Is USB ready for your PC? Mouse? Definitely. Camera? Sure. Modem? Maybe.

If you expect to see a performance increase by switching from serial to USB, you'll be disappointed. Our trusty U.S. Robotics external voice modem riding the lowly serial port kept up with or beat the USB modems we tested here in most tests. Even when downloading a raw text test, which should have given USB's higher bandwidth the upper hand, the USR serial modem kept pace. And, as is often the case with USB, Windows NT users are left out in the cold.

So why upgrade to USB? Connectivity. Want to unplug one USB modem and slap in another without rebooting? No problem. A USB modem will also theoretically give you better performance in online gaming because of the lower overhead requirements of USB. In our tests, though, we found no perceptible difference in gameplay with the online-only game *Tribes* using two of these modems. The Leopard actually gave us consistently bad ping times because of its Soft Modem technology.

If you're on an aggressive PC99 schedule and want to shed all ISA devices, USB is the way to go. But remember: serial and parallel ports ride the ISA bus. By the time serial ports fall completely out of favor, however, analog modems may be totally extinct.

—Gordon Ung

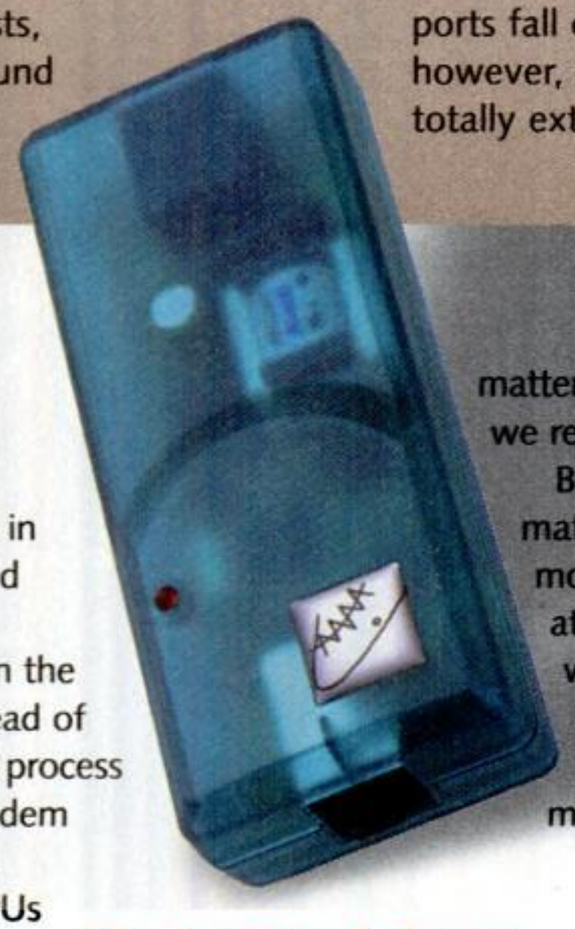
Shark Multimedia Leopard Pocket USB

PLUSES
- Cool looking
- Really does fit in your pocket
- Fastest file transfer scores
- Inexpensive

MINUSES
- Gags on intense online gaming
- Supplied USB cable too short

Call it the iModem. The svelte Leopard Pocket USB is arguably the cutest USB modem available. A single USB connector occupies one end, while the other has a standard RJ-11 jack. Sound from the modem is routed through your soundcard without clumsy cables, and you can use the Leopard as a full-duplex speaker phone through your system's mike and speakers.

Besides the *Miami Vice* styling, Shark includes a typical suite of communications programs. With the low power requirements—less than half a watt—the Leopard doesn't require the bulky transformer we've all grown used to with external modems. The Leopard was the only soft modem in the roundup and performed well in file transfers and browsing. Soft modems rely on the host CPU, instead of the modem, to process traffic. Soft-modem vendors argue that today's CPUs are enough to handle these chores. That may be the case with downloading files or browsing the web, but when we played the online-gaming card, the Leopard modem folded. Even armed with a 450MHz Pentium III, we couldn't achieve ping times lower than 370ms in *Tribes*, no matter when or how many times we redialed our ISP.



The Leopard chugs web pages like a frat boy downs beer, but it chokes on games.

But maybe that doesn't matter to you. The tiny modem is obviously aimed at the notebook user who won't be hitting too many game servers in the first place. With this caveat in mind, the Leopard is affordable, turned in the most respectable transfer speeds of the three modems here, and is worthy if you don't play intense online games.

THE SPECS

56K CONNECTIVITY	V.90, K56Flex
VIDEO PHONE V.80 SUPPORT?	Yes
OS SUPPORT	Win98
BUNDLE	Trio by Trio

MAXIMUM PC VERDICT

Price $80
Company Shark Multimedia
Phone 800.800.3321
URL www.sharkmm.com

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DARE TO COMPARE

MANUFACTURER/ MODEL	SHARK LEOPARD POCKET USB	MULTI-TECH MULTIMODEM USB	USR VOICE FAX MODEM PRO USB	USR SERIAL SPORTSTER
DOWNLOAD				
Text (708,622 bytes) (sec)	49.9	41.1	40.1	40.3
JPEG (608,711 bytes) (sec)	111.1	113.1	118.4	114.6
MP3 (5,120,390 bytes) (sec)	981.0	936.5	944.7	934.2
Zip (1,129,127 bytes) (sec)	203.5	208.1	207.7	206.9
Exe (560,128 bytes) (sec)	55.9	55.6	58.0	54.6
UPLOAD				
Text (sec)	86.7	59.5	76.3 (54.5*)	59.9
JPEG (sec)	178.3	185.0	228.7 (162.6*)	175.0
MP3 (sec)	1,490.3	1,500.0	1,935.1 (1,406.2*)	1,490.4
Zip (sec)	323.5	344.2	430.0 (300.0*)	323.0
Exe (sec)	98.6	82.9	107.0 (87.9*)	82.1

*V.34 speeds. **HOW WE TESTED:** Using a nonpublic directory on San Francisco Bay Area ISP Slip.Net, we downloaded and uploaded the same files during different times of the day and night using WS_FTP and recorded the best scores. Port speeds on all modems were set to the maximum. **TEST MACHINE:** 450MHz Pentium III, 192MB PC100 SDRAM, ASUS P2B motherboard with 1.07 BIOS.

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Muli-Tech MultiModem USB

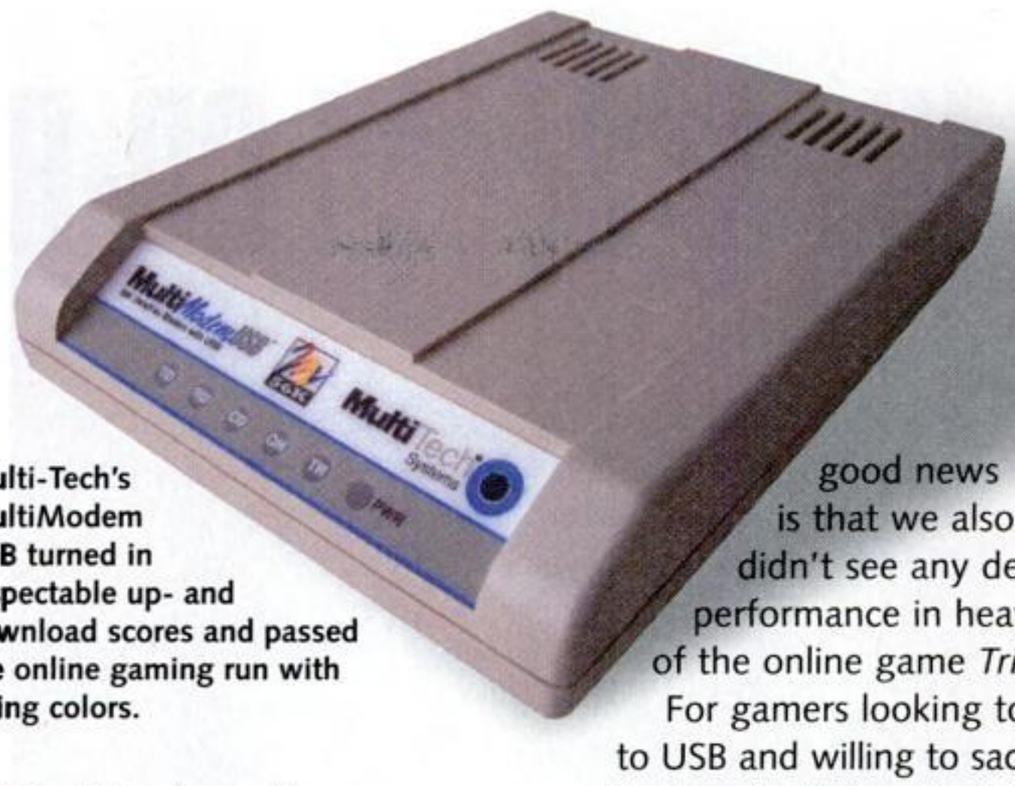
Multi-Tech's MultiModem gives you top performance wrapped in a plain white box. Although it didn't win every speed test, it was consistently near the top of the list. The Multi-Modem USB sips about 1 watt of power when operating, and thus doesn't need a separate power transformer. Though the MultiModem doesn't use an IRQ to control transfers, it reports that it uses one in the device manager for DOS applications that need it. The IRQ can be shared as well, according to Multi-Tech engineers.

What was missing? At this price we expect voice capability to be thrown in for free. A voice-capable version is available, though, and you do get caller ID and lightning protection. Multi-Tech also skimped on the speaker, which sounds like it was swiped from a kazoo.

The MultiModem installs with minimal hassle and has a pass-through for the phone line. Like the Leopard, the MultiModem gives you compatibility with K56Flex providers and of course supports V.90. The MultiModem turned in respectable scores, and in our online gaming it ran on par with our benchmark U.S. Robotics Sportster Voice serial modem.

Although Multi-Tech touts a possible performance increase in gaming, we didn't see it. But the good news is that we also didn't see any decrease in performance in heavy sessions of the online game *Tribes*.

For gamers looking to hop up to USB and willing to sacrifice a few bells and whistles, the MultiModem may be the best choice in town right now. About the only thing we could hope for in the MultiModem was full-character LED displays, something that's out of favor in the modem industry these days.



Multi-Tech's MultiModem USB turned in respectable up- and download scores and passed the online gaming run with flying colors.

THE SPECS

56K CONNECTIVITY
V.90, K56Flex

VIDEO PHONE V.80 SUPPORT?
Yes

OS SUPPORT
Win98

BUNDLE
DialTone

PLUSES
- Top-notch performance
- No power transformer
- USB modem gaming

MINUSES
- Plain vanilla case
- High price
- No voice capability
- Crappy speaker

MAXIMUM PC VERDICT

Price $170
Company Multi-Tech Systems
Phone 800.382.9717
URL www.multitech.com

7

U.S. Robotics 56K Voice Faxmodem Pro

You can thank U.S. Robotics for making the dreaded USB driver fiasco as famous among its users as the dreaded Matrox G200 OpenGL fiasco. What is the USB driver fiasco? It was created by USR's inability to provide USB drivers until six months after Windows 98 shipped.

Still, the Voice Faxmodem Pro was one of the first USB modems out the gate, and with a combination of winning features, this is still a great modem. USR crammed a full-duplex speaker-phone in the black box, which eliminates those CB-like conversations, good buddy. Over. And though it does support USB, the Faxmodem Pro includes a 25-pin serial port for those times when USB fails you—like in legacy DOS applications, Windows NT, BeOS, or other OSes that don't support USB yet. USR packs in a robust software suite, including Symantec's excellent *WinFax 8.0*.

Our main complaint came from the modem's finicky tastes when connecting at V.90 speeds. Download scores were par for a V.90, but when uploading, the USB Pro would not connect higher than 24Kbps. As a result, upload times were about 25 percent higher than the three other modems and placed it dead last. We disabled V.90 and X2 support and connected at V.34/33.6 to test the upload speeds. With the 56K support off, the Pro modem blazed away, and we were able to actually smash the scores of the three other modems here. What's going on? U.S. Robotics believes it's an issue with our provider's Lucent-based equipment and says that an upcoming firmware fix would address it. USR said there isn't a problem with 3Com and Ascend equipment that many ISPs run.

While we love the features of the USB Pro, we can't recommend it without the caveat that you may have to wait for a fix before you realize full speed on this modem with certain ISPs.

The Voice Faxmodem Pro is feature rich, but a confilict with our ISP cost it points.

THE SPECS

56K CONNECTIVITY
V.90, X2

VIDEO PHONE V.80 SUPPORT?
Yes

OS SUPPORT
Win98

BUNDLE
WinFax 8.0 | 3Com Connections Suite

PLUSES
- Both serial and USB ports
- Full duplex speakerphone
- Good software bundle

MINUSES
- Slowest FTP download score
- USR Bay of Pigs driver fiasco

MAXIMUM PC VERDICT

Price $199
Company US Robotics
URL www.usr.com
Phone 800.525.8771

8

Copyrighted material

Warp Speed CD-ROM Drives

The final frontier?

CD-ROM technology moves on. And remarkably, it's still evolving and growing. Case in point: the drives reviewed here use two very different technologies. The AOpen and Plextor drives are based on CAV technology, which spins the disc at a constant speed, so the data rate increases as the pickup moves to the outer edges of the disc; the Kenwood drive uses CLV technology, which varies the speed the disc spins at, so the data rate of the drive is constant. In the past, CLV drives could only reach speeds up to 16x, while the inherently faster CAV drives suffered instability above 24x when faced with unbalanced discs. Manufacturers have found some ingenious methods to get beyond these limitations, and these drives are a testament to these innovative technologies.

—Sean Cleveland

Kenwood 52x TrueX

PLUSES
- Upgradable flash firmware
- The best real-world performance
- Multiread support
- Fastest overall throughput
- Fat 2MB buffer size

MINUSES
- Uneven high-end throughput

AOpen CD-948E 48x

PLUSES
- Multiread support
- Ultra DMA/33 support

MINUSES
- Problems reading small files
- Problematic audio extraction
- A bit noisy
- Built using CAV technology

Plextor UltraPlex Wide

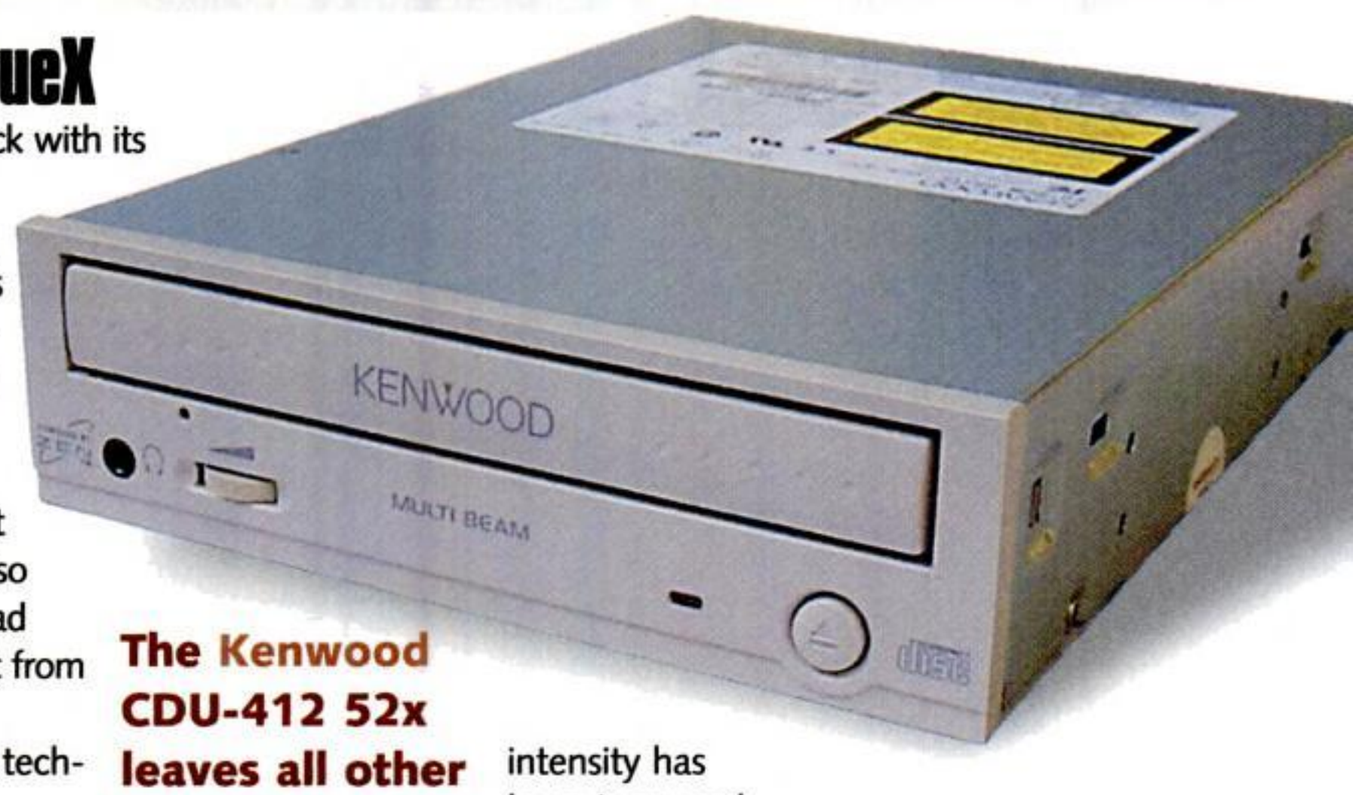
PLUSES
- Multiread support
- Lowest random access time
- Highest digital audio extraction speeds
- Highest burst rates
- Upgradable flash firmware

MINUSES
- Unable to attain 24x digital audio extraction
- CAV technology

Kenwood 52x TrueX

MAXIMUM PC KICK ASS! product

Back on the attack with its latest offering and once again leveraging Zen's TrueX technology, Kenwood has increased the speed and improved every other aspect of its drive. Kenwood has also managed to include multiread capability, which was absent from its 40x drive.



The Kenwood CDU-412 52x leaves all other CD-ROM drives in the dust. All of them!

For those new to TrueX technology, it's quite simple. A single laser is split into seven distinct beams that read multiple tracks of data in parallel. Since more data is being read, the disc needs to be spun at only half the speed of CAV drives—around 9.5x on the inside tracks (4,750RPM) and 3.7x on the outside tracks (1,840RPM). This guarantees data integrity and reduces problems with uneven media. The payoff is a data stream pumped into your PC at a whopping 7MB/sec across the whole disc (which is even faster than a lot of hard drives!). However, while benchmarking the 52x, we found that the data rate depends on the zone read. Inside tracks deliver data rates around 49x, and max speed is achieved only on outer tracks. But let's not quibble over the 3x difference.

Kenwood has improved other parts of the drive as well. Random access times dropped from 92ms in our original review of Kenwood's 40x drive to 81ms. The newer 40x drive, with updated firmware, delivered times of 85ms. Also, the full-stroke access time was much faster, and burst speeds jumped by over a megabyte. But the proof is in the pudding: the real-world copy benchmark came in almost 2½ minutes lower than the 40x drive.

The 52x contains optimized firmware utilizing the same ASIC as the 40x drive. Also, the laser intensity has been increased to help with the faster spindle rate (the 40x drive spun at a maximum speed of 9x). We did find digital audio extraction to be slower—it was cut in half from the 23x speeds the early 40x attained—though this did increase data integrity. This is a minor strike against such a powerhouse of a drive.

THE SPECS

INTERNAL BUFFER SIZE	
	2MB
INTERFACE	
	Bus-mastering ATAPI (EIDE)
ROTATIONAL SPEED	
	1,840 to 4,750RPM (CLV)
FRONT PANEL	
	Load/Eject button
	Busy LED
	3.5mm stereo headphone jack
	Rotary volume control knob
MEDIA SUPPORTED	
	CD-ROM Mode 1 and 2 | CD-ROM/XA (Mode 2, Form 1 and Form 2) | CD-Extra | CD-DA Audio | Photo CD (Single- and Multi-Session) | CD-I | Video CD and I-TRAX CD | CD-R CD-RW

The Kenwood 52x may be expensive compared to other EIDE drives, but the performance justifies its higher price. This drive is untouchable and a must for any power user.

MAXIMUM PC VERDICT

Price $129
Company HiVal
Phone 714.953.3000
URL www.hival.com

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DARE TO COMPARE

MANUFACTURER	KENWOOD	KENWOOD	AOPEN	PLEXTOR
Drive Model	UCR-412	UCR-401	CD-948E	UltraPlex
CD TACH BENCHMARKS[1]				
Drive rating	49.4x	45.8x	31.9x	27.7x
Avg. 16K sequential read (MB/sec)	7.6	6.8	5.3	4.6
Min. 16k sequential read (MB/sec)	7.0	6.5	3.1	2.7
Max. 16k sequential read (MB/sec)	7.3	6.8	7.1	6.2
Full-stroke access time (ms)	178	279	207	130
Random access time (ms)	83	85	98	79
Full-speed CPU utilization (%/drive rating)	11% (52x)	11% (46x)	11% (48x)	11% (42x)
2K interface burst speed (MB/sec)	5.0	2.7	4.5	9.8
8K interface burst speed (MB/sec)	7.1	5.5	11.2	19.0
16K interface burst speed (MB/sec)	7.7	6.5	15.2	22.8
REDBOOK AUDIO EXTRACTION BENCHMARKS[2]				
Extraction speed	12-13x	12-13x	8-9x	16x
Extraction quality	Excellent	Excellent	Problematic	Excellent
REAL-WORLD COPY BENCHMARK[3]				
Time to copy contents (min:sec)	4:16	6:29	11:30	4:14

[1]Performs a full benchmark assault on CD-ROM drives. [2]Converts CD Audio to a WAV file. [3]Time to copy Maximum CD #1 to hard drive.

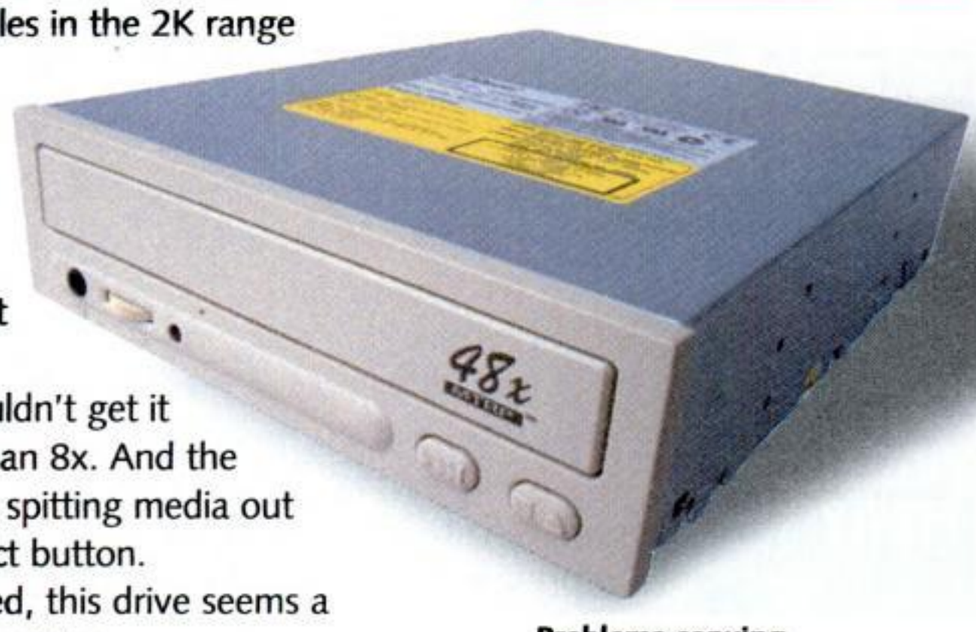
AOpen CD-948E 48x

AOpen's latest has solved the problems CAV drives face at higher speeds by tuning each drive before shipping. And it works, because the CD-948E had no problems on the outer tracks of a full CD.

The CD-948E supports Ultra DMA/33, which doubles the data rate to 33MB/sec over standard EIDE (PIO mode 4). But enabling it was daunting. After consulting the manual and web site, we turned to AOpen. UDMA is enabled by removing the jumper labeled "T" on the back left bottom of the drive (the other two sets of jumpers are used by AOpen internally and do nothing, even the one labeled "Turbo"). Doing so increased only the burst rate and nothing more, and even then, it comes nowhere near 33MB/sec.

The CD-948E is a high-performance drive, except for the higher than average 98ms random access. This may be because the high 9,000RPM spindle takes longer to attain full speed. The real problem lies in real-world performance. Our sequential benchmark of copying 650MB of content to a hard drive took three times longer for the CD-948E than the other drives. The problem is related to reading small files in the 2K range (the CD Tach numbers in the chart represent benchmarks using 16K file sizes). Using 2K sizes yielded speeds of 32x up to 400MB, at which point the speed drops down to around 15x. Also, we couldn't get it to capture audio faster than 8x. And the drive often had problems spitting media out when we pressed the eject button.

For the price and speed, this drive seems a bargain, but looks are deceiving.



Problems copying small files plague this otherwise high-speed drive.

MAXIMUM PC VERDICT

Price $69
Company AOpen Component Solutions
Phone 888.852.6736
URL www.aopenusa.com

7

THE SPECS

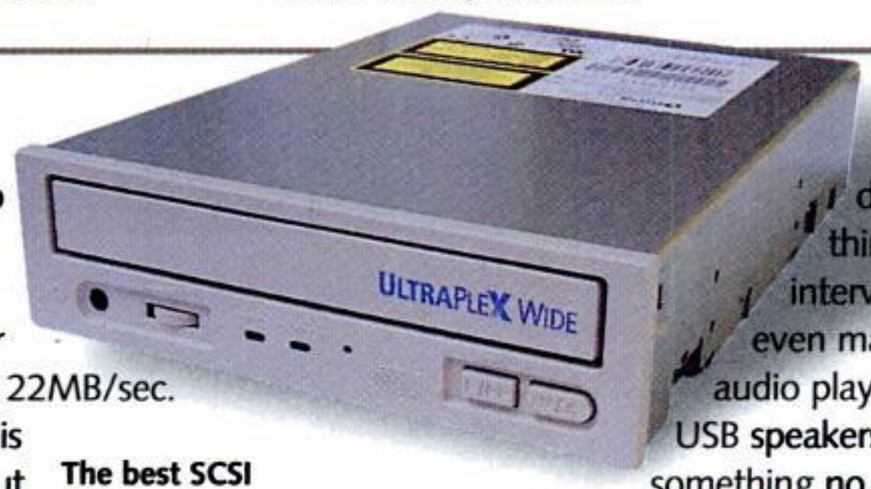
INTERNAL BUFFER SIZE
512K
INTERFACE
Bus mastering ATAPI (EIDE)
Ultra DMA/33 Mode2
ROTATIONAL SPEED
9,000RPM (CAV)
FRONT PANEL
Load/Play buttons
Power on/busy LED
3.5mm stereo headphone jack
Rotary volume control knob
MEDIA SUPPORTED
CD-ROM Mode 1 and 2 | CD-ROM/XA (Mode 2, Form 1 and Form 2) | CD-Extra | CD-DA Audio | Photo CD (Single- and Multi-Session) | CD-I | Video CD and I-TRAX CD | CD-R and CD-RW

Plextor UltraPlex Wide

Plextor's newest takes the plunge into Wide Ultra SCSI. Unfortunately, Wide SCSI, while offering hard drives a data bus of 40MB/sec, doesn't do much for this drive whose top bursts are around 22MB/sec.

When stressed, the UltraPlex Wide is a solid performer. Except for throughput scores, it finished first among the drives tested here, even in audio extraction, although we couldn't get it to extract faster than 16x (it's advertised at 24x). We were surprised when it finished the real-world copy benchmark faster than Kenwood's 52x drive. How could this be? Plextor's burst technology and advanced caching algorithms play a major role in this. A low random access speed of 79ms also makes a the difference. But frankly, we believe drives that spin the disc at high-speeds come up short—you need a full disc to benefit from the drive's full speed.

With *PlexManager*, CD-Audio files are seen as WAV files, making them easy to copy directly from discs without third-party intervention. It even makes digital audio playback over USB speakers a reality, something no other SCSI drive can do. And digital audio can be played directly over the SCSI bus on an external drive.



The best SCSI drive, yet no match for TrueX.

Mechanically, the UltraPlex is solid, and if you're dead-set on SCSI, this is definitely the one to get (Plextor doesn't make ATAPI drives). But if it came down to the UltraPlex or Kenwood's 52x TrueX, we'd go with Kenwood.

MAXIMUM PC VERDICT

Price $200 ($279 for external version)
Company Plextor
Phone 800.475.3986
URL www.plextor.com

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THE SPECS

INTERNAL BUFFER SIZE
512K
INTERFACE
Wide Ultra SCSI
ROTATIONAL SPEED
8,590RPM (CAV)
FRONT PANEL
Load/Play buttons
Disc In and power LEDs
3.5mm stereo headphone jack
Rotary volume control knob
MEDIA SUPPORTED
CD-ROM Mode 1 and 2 | CD-ROM/XA (Mode 2, Form 1; Multisession Mode 1 & 2 and Form2) | ISO 9660-HFS | Rockridge | Enhanced CD | CD+G | CD-Midi | CD-Tex | CD-Extra | CD-DA Audio | Photo CD (Single- and Multi-Session), CD-I | Video CD | CD-R and CD-RW (variable packets)

For definitions of Terminator words, hyperlink to the back of Maximum PC, or check out the Terminator online at www.maximumpc.com.

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Removable Storage on the Move

Two neo-floppy drives duke it out

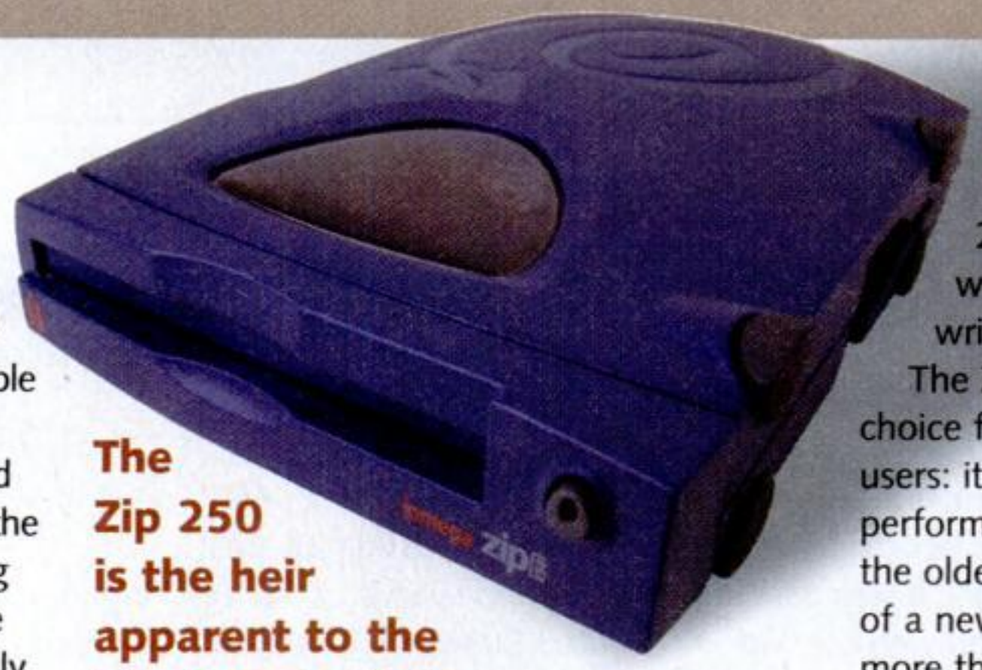
Nothing tugs at our heart more than hearing the abandoned owners of the Avatar Shark or the SyQuest SyJet and SparQ profess the superiority of these dead-end technologies. The drives were good in their time, but without a company backing them up, you might as well store all your important files under a rock.

To forestall obsolescence, new versions of both the SuperDisk and the mighty Zip have come to a store near you. The Addonics Pocket SuperDisk and the Zip 250 add new twists to the technologies, but neither is innovative enough to justify replacing what you already have.

—Sean Downey

Iomega Zip 250

Iomega's 100MB Zip drive has become so popular, it could be the de facto floppy replacement. But as the need for bigger and faster removable storage continues to grow, Iomega needed to find a way to breathe new life into its aging technology. Enter the 250MB Zip drive. Fully backward-compatible, the new Zip 250 successfully extends the Zip's reign into the 250MB realm. Unfortunately it does so by sacrificing write performance.



The Zip 250 is the heir apparent to the Zip dynasty, but it's none too gentle with its older subjects.

THE SPECS

INTERFACE	
SCSI	
DISK CAPACITY	
250MB ($20)	
100MB ($16)	
BUNDLE	
1-Step Backup I Guest I Copy Machine I Record-it	

PLUSES
- Larger capacity in the same size as original Zip
- Faster with 250MB disks
- Fully backward compatible with original Zip disks

MINUSES
- Poor read/write speed with 100MB disks
- Lackluster write performance

Iomega upped the capacity of the Zip 250 by shrinking the drive head and increasing the areal density of the 250MB disks. This yields significant increases in read/write speeds when the drive uses 250MB disks, but results in writer's block on 100MB disks, since the new smaller head has to do twice the work to cover the same area. In our benchmarks, the Zip 250 showed excellent form when reading from either 250MB or 100MB disks, but was painfully slow when writing to 100MB disks.

The Zip 250 presents a difficult choice for performance-minded Zip users: it doesn't offer a significant performance increase when using the older media. But since the price of a new 250MB disk is only slightly more than their 100MB variety, this may be a moot point.

MAXIMUM PC VERDICT

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Price $200
Company Iomega
Phone 800.697.8833
URL www.iomega.com

DARE TO COMPARE

MANUFACTURER / DRIVE MODEL	IOMEGA ZIP 250[1]	IOMEGA ZIP 250[1]	IOMEGA INTERNAL ZIP[1]	ADDONICS POCKET SUPERDISK[1]	IMATION INTERNAL SUPERDISK[2]
Capacity Tested	250MB	100MB	100MB	120MB	120MB
HD TACH BENCHMARKS[3]					
Average read speed (MB/sec)	1.8	1.1	0.6	0.4	0.3
Average write speed (MB/sec)	0.8	0.1	0.6	0.2	0.2
Read burst speed (MB/sec)	2.3	1.4	0.8	0.5	0.5
Random access time (ms)	46.9	48.3	44.1	121.5	116.5
CPU utilization	7%	2.7%	30.6%	17.6%	8.9%
REAL-WORLD COPY BENCHMARK[4]					
Time to format (min:sec)	13:19	0:46	9:10	18:44	19:10
Formatted capacity	238MB	95.7MB	95.7MB	120.3MB	120.3MB
Time to fill disk (min:sec)	5:18	13:53	2:23	11:51	11:49
Time to copy from full disk (min:sec)	2:37	1:35	2:29	6:37	6:29

[1]Tested on a Micron Millennia Pentium II 400MHz with 64MB. [2]Tested on a Winbook XL2 Pentium II 366MHz with 128MB.
[3]Performs a full benchmark assault on drives. [4]Real-world tests with real-world data.

The Pocket SuperDisk serves up floppy compatibility and subpar performance.

POCKET SUPERDISK

Addonics takes the SuperDisk on the road by slimming it down and mating it with a PCMCIA IDE controller. It's a svelte version of the original that draws power from the PCMCIA port or the keyboard connector. Unfortunately, shrinking the size of the SuperDisk Addonics has also shrunk the drive's transfer rates. This wouldn't be awful if the SuperDisk's transfer rates weren't already abysmally slow.

By design, SuperDisks are inextricably linked to the size and speed of the obsolete floppy. The drive head is bogged down by its dual function, and the media is limited to the 3.5-inch floppy formfactor. The SuperDisk is so horribly encumbered by floppy compatibility that it requires hard drive spooling software, which speeds up write speeds by storing data on the hard drive and trickling it out to the drive in the background at a rate the SuperDisk can handle. In our benchmarks, the Pocket SuperDisk yielded transfer rates below other removable drives such as the Zip, and even fell behind traditionally slower technologies such as CD-RW and magneto-optical.

While the SuperDisk's backward compatibility with the archaic 3.5-inch floppy is handy when it comes to floppy replacements in OEM systems, trading off compatibility at the expense of adequate performance isn't worth it.

MAXIMUM PC VERDICT

5

Price $228
Company Addonics
Phone 888.584.8324
URL www.addonics.com

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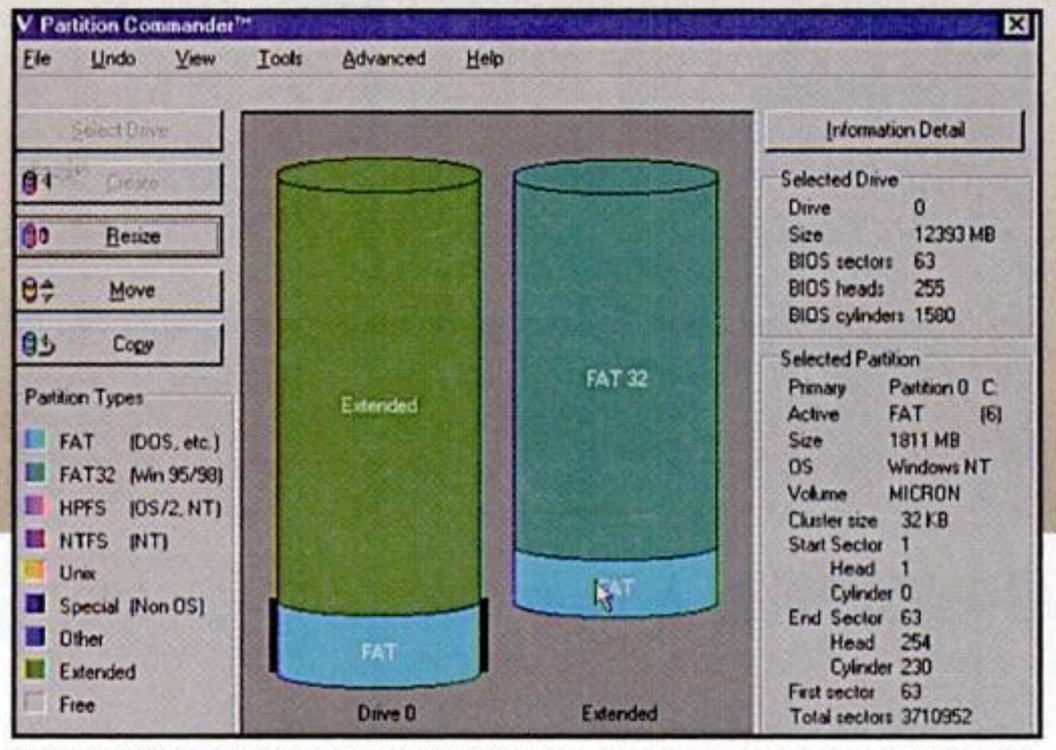
Partition Utilities

Slicing up your hard drive

Not sure how your hard drive's partitions are configured? Ever wonder how to wring more space out of it? Don't even know what a partition is? Fear not, these apps are here to help.

—Sean Cleveland



Partition Commander runs in DOS mode, which means you don't have to reboot after making changes. This method is too simplistic and not recommended for those running Windows NT.

Partition Commander with System Commander Personal Edition

Partition Commander's three Wizards walk you through an automated process and offer suggestions for the best way to slice up your hard drive. Or you can venture on your own and manually manipulate partitions.

The first wizard creates more drive space, moves unused space, searches for free space, and recovers wasted space. The second offers faster disk access by creating a partition for the Windows swap file. It took us about 20 minutes to create the recommended 20MB partition while the program restructured directories. The third wizard organizes the OS and its apps and data by separating them. Unfortunately, the wizard only lets you create up to two partitions for doing this.

We recommend manual partitioning. *Partition Commander* adequately guides you through resizing, deleting, formatting, moving, copying, validating, and optimizing partitions. Optimizing was the best. It determines the cluster size that works best for your data. We converted from 8K to 2K clusters, freeing up 17MB (taking only 5 minutes). Advanced features include hiding and converting partitions. We tried converting a FAT16 primary partition with an NT boot loader (NT 4.0 was installed on the second partition) to FAT32. *Partition Commander* properly displayed a message explaining it wasn't recommended (but didn't say why). Then we tried converting the second NT partition to FAT32, and no error message was displayed. Doing so would have hosed NT. Partitions can be converted between FAT16 and FAT32, and changes for everything can be undone via a multiple undo feature. Other utilities let you restore the Master Boot Record (MBR) and diagnose partitions.

Partition Commander comes on two floppies for DOS and Win95/98. For WinNT or OS/2, it must be run from DOS, meaning the primary partition must be a FAT file system. It supports drives larger than 8.4GB, and FAT12, FAT16 (FAT), VFAT, FAT32, NTFS, HPFS, and various Unix file systems.

Also included is *System Commander Personal Edition*, which differs from the Kick Ass full version in that it doesn't support booting multiple OSes from the primary partition, among other things.

We most liked the *Partition Commander*'s Optimize utility and the Advisor buttons that explained things in detail. But we recommend saving up and getting *PartitionMagic* instead.

MAXIMUM PC VERDICT

Price $50
Company V Communications
Phone 800.648.8266
URL www.v-com.com

6

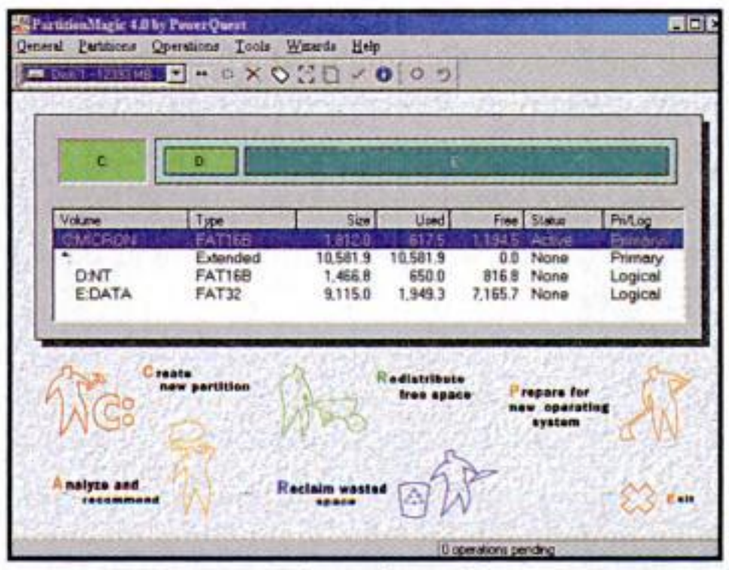
PartitionMagic 4.0 with BootMagic

MAXIMUM PC KICK ASS! product

PartitionMagic is back, adding support for drives larger than 8.4GB, native executables for Win95/98 and NT, and wizard functionality for beginners.

The new wizards expedite functions such as creating partitions, redistributing and reclaiming available space, and adding OSes. An analyze-and-recommend feature balances free space and alerts for wasted space. These wizards work, but contain no "advanced" buttons that explain changes, and are backed up by sparse documentation.

PartitionMagic's tools for resizing, moving, creating, deleting, labeling, formatting, copying, and checking partitions are excellent for power users. You'll get info screens with stats on disk usage, FAT and partition particulars, and cluster waste. Conversions from FAT to FAT32, HPFS, Linux Ext2, Linux Swap, and NTFS are covered. And it properly warns when converting may hose OSes. Changes made to partitions require rebooting the machine, although this is a shortcoming of Windows and not *PartitionMagic*.


PartitionMagic 4.0 by PowerQuest
General Partitions Operations Tools Wizards Help
Volume Type Size Used Free Status Ph/Log
C:MICRON FAT16B 1,812.0 617.5 1,194.5 Active Primary
Extended 10,581.9 10,581.9 0.0 None Primary
D:NT FAT16B 1,466.8 650.0 816.8 None Logical
E:DATA FAT32 9,115.0 1,949.3 7,165.7 None Logical
Create new partition
Redistribute free space
Prepare for new operating system
Analyze and recommend
Reclaim wasted space
Exit
0 operations pending

PartitionMagic 4.0 is the solution for any partitioner. It contains native support for DOS, Win95/98, and WinNT. We recommend it highly for any scenario.

Underlying utilities include DriveMapper, which updates drive letters for your apps after a new partition has been made, and MagicMover, which moves whole applications between partitions or drives. We successfully moved *Photoshop* from C:\apps to E:\, and got an operation summary that impressed us. PartitionInfo displays even more details, with error and troubleshooting info, as well. Finally, PQBoot allows changing the active partition to load OSes without resorting to a full-blown loader.

BootMagic is the other half of *Partition Magic*. It's essentially a boot-loader that replaces the MBR, allowing you to run multiple OSes from the same partition. It automatically installs into \BTMAGIC.PQ directory on your primary partition.

We recommend downloading the updated patches on PowerQuest's web site before you dive in. And you should dive in.

MAXIMUM PC VERDICT

Price $70
Company PowerQuest
Phone 800.379.2766
URL www.powerquest.com

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Cut! Print it!

Digital-video editors that won't break your budget

You don't need a *Titanic* budget to edit your home movies into something spectacular. The following video-editing applications, all of which cost less than $200, let you cut and paste, and add titles, transitions, music, narration, and even a special effect or two. While these editors won't turn you into a James Cameron overnight, they will give you the tools to make movies you and your friends won't dread sitting through.

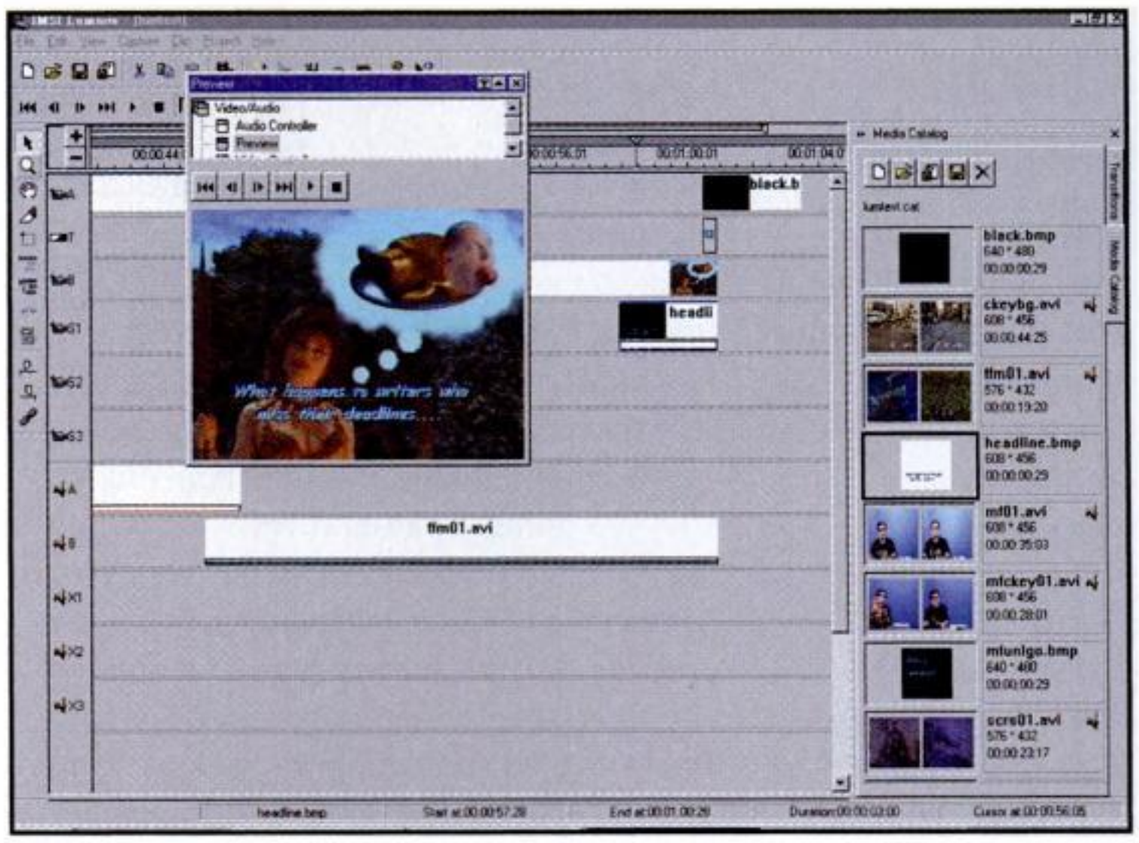
—Tim Liebe

Lumiere Video Studio

Lumiere is the most powerful and the least expensive nonlinear editor (NLE) of the packages reviewed here, offering most of the features found within the $895 Adobe *Premiere* (which received a 9/Kick Ass in the September 1998 issue). *Lumiere* also has the fastest rendering speeds in this roundup, beating the other three contenders by nearly 50 percent in our render test.

Lumiere's chromakey feature isn't as good as *Premiere*'s, but it's better than *VideoWave II*'s. In addition to blue screen and green screen (standard keying colors), there's also a Chroma option for selecting a key color from the video with an eye-dropper—*VideoWave* handles it the same way. And the two other applications dropped this feature altogether. There are also Difference Mattes, which only include changes between your foreground and background clips. In all cases, there are adjustments for key smoothing and types of image merging as well as key tolerance (how exact you want the match to the key color to be). This tool is extremely helpful if your lighting is less than perfect; however, the better your lighting, the better your results.

As an added bonus, *Lumiere* comes with a CD of royalty-free music and a limited version of Sonic Desktop's *SmartSound*. This clever applet lets you generate royalty-free music and sound effects for your production. It contains six musical QuickTracks and three sound-effect QuickTracks. Each QuickTrack contains several different "styles" with preset tempos, instrumentations, and moods. The only drawback is that the music it generates sounds like library music (royalty-free).



There's no built-in titler, but you can key graphic files over video in Lumiere.

While there's a lot to like about *Lumiere*, there are areas we'd like to see addressed. Its clip-trimming application is wonky. If you double-click on the clip in the Project Window, a Video Controller window comes up, complete with Mark In/Out and Punch (trim) In/Out icons. Don't use it to trim your clip, though, because it won't trim the audio at the same time. To trim video and audio together, you either have to drag on the ends of a clip or preview it in the Project Window, then use the Punch In/Out controls located in the Movie Bar along the left-hand side.

Lumiere also lacks a built-in titler—a major faux pas in our book. As a work-around, IMSI bundles Corel's *PhotoPaint Plus 7*. The manual recommends the clumsy solution of creating titles in *PhotoPaint Plus* with solid color backgrounds, then using the Transparency option to key titles over video.

Video capture and "building" (rendering) inside the application are both multistep processes that should be streamlined. For video capture, you not only have to select capture options beforehand (including framerate, capture card, and audio options), you also have to select both video and audio options after the capture's done. To build a video, you first go into Options to select output size, audio settings, and framerate. Next, you go to Build, name your clip, select Compressed Video, then Export to start rendering. You don't get to select which codec to use until *after* the audio rendering is over.

If you take the time to dig into *Lumiere* and get past its learning curve, you'll find it offers a lot more than the other apps here.

MAXIMUM PC VERDICT

Price $79
Company IMSI
Phone 800.833.8082
URL www.imsisoft.com

8

DARE TO COMPARE

COMPANY	AVID	IMSI	MGI	ULEAD
PRODUCT	CINEMA	LUMIERE	VIDEOWAVE II	VIDEO STUDIO 3.0
Price	$139	$79	$99	$100
Number of audio tracks	3	98*	6	3
Number of video tracks	1	98*	1	1
Titler with drop shadow	N	N	Y	N
Max output resolution	640x480	640x480	720x480	640x480
Batch capture	N	N	N	N
R/T A/V scrubbing	Y	Y	N	Y
Number of transitions	63	69	51	106
Video in/output formats	MOV, AVI (in); MOV, AVI, RM, MPEG 1 (out)	AVI, MOV	AVI, MOV, MPEG 1, DV	AVI, MOV, MPEG 1
Render time benchmark	16:35** (Indeo)	9:21(M-JPEG) 1:13 (indeo)	17:15 (M-JPEG) 5:02 (Indeo)	16:30 (M-JPEG) 4:55 (Indeo)

* Two source tracks and 96 superimposition tracks, ** Would not load M-JPEG files.

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Video Studio 3.0

Video Studio 3.0 is nonlinear editor that lets Joe Consumer add transitions, titles, music, and narration to his/her home videos. While we're not big fans of storyline-type editors such as *Video Studio* because they tend to sacrifice features for ease of use, its implementation is certainly better than *VideoWave II*'s. For precision editing, there's an optional timeline interface. A feature called Smart Render saves transitions and titles only, so previews and rendering take less time.

If you're a novice editor or in a hurry, you'll love *Video Studio*'s Video Wizard feature. A "training wheels" video editor, Video Wizard uses a simplified storyline to walk you through projects from capture to final creation. There's limited flexibility

Video Studio is a storyline editor with a timeline option.

(only nine transitions, and no title keying), but it's a breeze to use and has a great clip-trimming feature.

There are two ways to trim clips inside *Video Studio* itself. The default method makes you drag the Trim Bar in the Preview window to mark your in- and out-points, which is frustrating. Fortunately, there's a workaround that uses the F3 and F4 keys.

Video Studio lags behind *VideoWave II* in a couple areas, though. There are no drop-shadows or outlines on titles, and only three audio tracks (live video, background music, and narration). Narration can be recorded while previewing, though.

Video Wizard, Smart Render, and the timeline interface option make *Video Studio* 3.0 a good bet for beginning video makers. However, we'd like to see the lack of drop-shadow titles addressed in the future.

MAXIMUM PC VERDICT

Price $100
Company Ulead Systems Inc.
Phone 310.523.9393
URL www.ulead.com

7

VideoWave II

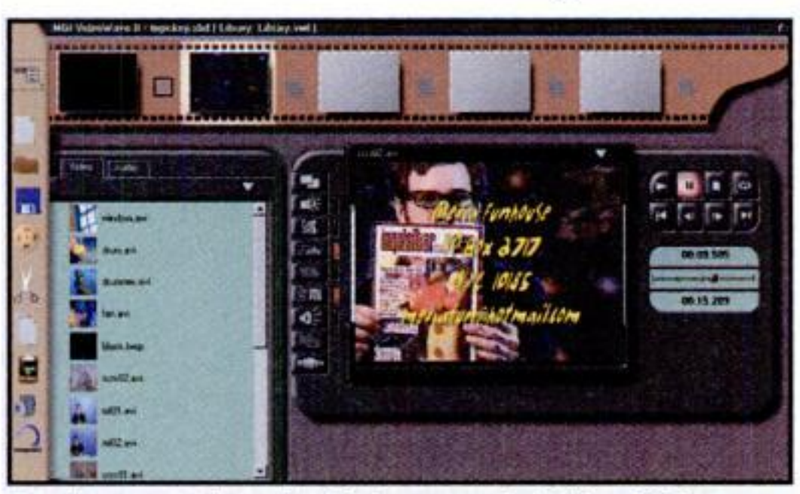
MGI's *VideoWave II* is an improvement over its predecessor, with new features such as Darkroom (to tweak your clips' brightness, contrast, and color) and enhancements on old features such as the chromakey and titler. Unfortunately, MGI hasn't rethought the overall interface.

VideoWave II uses a storyline rather than a timeline interface to make editing easier for beginners. Storylines may be easy, but they're sure not flexible. Unlike other storyline applications in this roundup, there's no timeline interface option that will let you, say, drop more than one title into a clip.

Moreover, almost every editing function, even one as basic as clip trimming, has its own separate "Mode." To perform a function, you first have to click on the appropriate button on the Mode Selector.

Because *VideoWave II* uses a storyline interface, it's difficult to time music or narration over more than one clip. In the 320x240 test, we laid in a music track over a three-clip-long introductory sequence using the Audio Studio. The software won't preview multiple sequences with music, so it took several tries to get the timing right. Although you can include multiple sounds within a video clip and even layer sounds, it's hard to hit a specific mark with the Audio Studio Control Panel.

VideoWave II is marketed as an easy-to-use NLE application for beginners. Though it looks easy at first glance, the multistep interface will drive you bananas.


Eyedropper color select lets you get within striking distance of a successful chromakey with VideoWave II.

MAXIMUM PC VERDICT

Price $99
Company MGI Software Corp.
Phone 905.764.7000
URL www.mgisoft.com

4

Avid Cinema

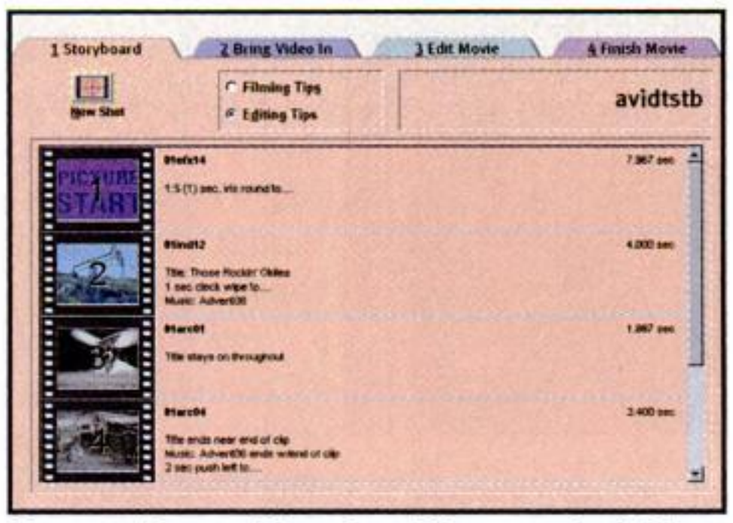
We're all for ease of use, but we don't like being painted into a corner to get it. That's what Avid Technology has done with its first consumer NLE application, *Avid Cinema*. Unlike the other applications in this roundup, which support any hardware card supporting AVIs, *Avid Cinema* supports only six capture cards, three of which have no video output. There is a workaround for this, but it requires putting in a call to tech support.

Avid Cinema's Edit Movie interface is limiting. The Trim Handles are supposed to make trimming a video, audio, title, or transition clip easier by letting you drag it to the correct length while watching the Viewer. However, there's no project time counter or time bar, so it's tough to cut to a specific length. Since that's the only way to trim, you can forget splitting a clip. And again drop-shadows and outlines on titles are lacking.

There are limited rendering/output options. Your sizes are limited to 320x240- or 160x120-pixel QuickTime or AVI files, or RealMedia unless your supported videocard has 640x480 output.

Avid Cinema does have its good points. The Storyboard lets you arrange clips and include notes for shooting or editing, which you can then print out.

It's hard to believe this product comes from the company whose name is synonymous with nonlinear editing in Hollywood. Only beginners would find it useful, and they'll outgrow it in a hurry.



More nonlinear editors should incorporate Avid Cinema's Storyboard feature.

MAXIMUM PC VERDICT

Price $139
Company Avid Technology Inc.
Phone 800.949.2843
URL www.avidcinema.com

2

Copyrighted material

Prop-Driven WWII Flight Sims

Ich bin ein Flugsimulator

It was a more romantic time, an era of piston engines and whining propellers. With the world at war, the sky became a battleground and pilots flew riveted metal crates by stick, rudder, and instinct.

Today, three new simulators bring this age back to life using the latest PC technology. *WWII Fighters* brings juicy 3D visuals, *European Air War* has precise flight models, and *Combat Flight Simulator* has easy handling and a high fun factor.

—Frank Lenk

European Air War

This isn't the best-looking WWII sim in this roundup, but it packs a wallop under the hood, with ultra-realistic flight models, sharp AI, and a dynamic campaign.

The most amazing thing about *EAW* is the way it simulates massive bombing missions, often with more than 50 aircraft in close proximity. In chase view, you'll see B-17 turret gunners locked in fierce battle with swarms of FW-190s. Despite the number of planes in the air, AI pilots all seem to fly complete missions of their own.

The biggest failing in *EAW* is that this type of mass-bombing mission is the staple diet. You can fly as escort or interceptor, for the United States, Britain, or Germany. But after a while, you long for the quick, nap-of-the-earth action of Microsoft's *Combat Flight Simulator*.

Graphics are excellent by past standards, even if they don't push the current envelope too hard. Display is hardwired for 640x480, although you do get 16-bit color and acceleration via either Glide or Direct3D.

Using about 200 polygons apiece, aircraft exteriors are less detailed than in Jane's *WWII Fighters*, but lovingly painted and still better than any we've seen before in historical sims. High-flying aircraft leave translucent vapor trails and belch black smoke when an engine is hit. Machine guns spew shell casings.

The graphic engine's limitations are more apparent when you look earthward. A thick haze hides the horizon, and terrain is mostly just repetitive field and city textures, up to 256x256, applied to an almost mathematically flat map. Still, at low level the landscape sprouts well-drawn random trees that provide an excellent altitude cue for landings.

Limited only by the 640x480 resolution, the virtual cockpit is clear and functional. Target cockpit view lacks altitude cues, but you can snap a look forward to get your bearings

The virtual cockpit view isn't as dazzling as in *WWII Fighters*, but it works, with all dials fully functional. More HUD info would be good, but the option to use *Quake*-like mouse moves to pan around both inside the cockpit and in chase view is very cool.

Score one for Adolph! Explosions in European Air War are dramatic and include meaningful detail.

Campaign play is very complete, with dynamic campaigns for three time periods, playable from the American, British, or German perspective. Battle lines move in response to your aerial accomplishments, and you can opt to play with limited supply.

Single missions are easy to set up on a fill-in-the-blanks display. Bombers remain in care of the AI.

Radio communications are exceptional. You can have wingmen cover your tail or engage bandits independently. As flight or squadron leader, you command multiple flights.

Flight models are a particular high point: far and away the most interesting of the three WWII sims. The physics are brilliantly conceived, with convincing inertia effects. More important, planes just *feel* right. Stalls lurk alarmingly close, signaled by convincing cockpit shake and oilcan buffeting sounds. Spins are all too easy to get into and disastrously difficult to get out of. To survive, you have to push the plane's limits, and *EAW* isn't shy about telling you when you've pushed too far.

Performance was excellent up until the sky filled with planes, at which point framerates plummeted into the low (but still playable) teens. Hard drive footprint is a miniscule 50MB. Force feedback is excellent, switchable between two flavors: a fairly subtle, realistic mode, and a more muscular arcade mode.

If you want maximum eye candy, go for Jane's *WWII Fighters*. But if you want a strenuously realistic aerial workout, *European Air War* is the connoisseur's choice.

MAXIMUM PC VERDICT

Price $50
Company MicroProse
Phone 510.864.4440
URL www.microprose.com

8

For definitions of Terminator words, hyperlink to the back of Maximum PC, or check out the Terminator online at www.maximumpc.com.

Copyrighted material

WWII Fighters

Jane's *WWII Fighters* is perhaps the most visually stunning flight sim ever. But despite soaring ambitions, it seems strangely unfinished in key areas.

The killer visuals are almost worth the price of admission. Running at up to 1280x1024 in 32-bit color, *WWII Fighters* has aircraft models so realistic you can practically see the pilot sweat.

Jane's won't discuss polygon counts, but each aircraft has a fully visible load-out, accurate detailing, moving control surfaces, and ambient lighting. Battle-damaged wing skin reveals underlying ribs, and a torn aileron produces the bank you'd expect. Atmosphere effects are superlative, with *the* best clouds in any sim, ever—puffy, translucent, and appropriately sunlit. The terrain has lots of rolling 3D hills, but uninspired textures: mottled brown slopes and mottled white snowfields.

A virtual cockpit is the only kind you get. Instruments are sharp and always live. The winter scenery in monotonous, but accurately rendered.

The virtual cockpit is up to Jane's best standards. Gauges remain legible at all times, and you can keep up to three instruments overlaid in the corner of your screen.

On the flip side, *WWII Fighters* is one hungry hunk of code. While Jane includes support for 3Dfx Glide, OpenGL, and Direct3D, you'll need at least a P-II 300 to truly enjoy the game.

When we tested the game on our Voodoo²-equipped P-II 233, at mere 640x480 resolution, framerates often dipped below 10fps. With visual detail down to minimum, animation swung between 40fps in an empty sky to a barely playable 15fps in a crowded furball.

Even if you have the silicon to support it, *WWII Fighters* leaves you shortchanged in several areas. It covers only a small piece of Europe over two weeks during the Battle of the Bulge. It also omits wingman communications, and hence any dimension of command. And the campaign mode is rudimentary. The powerful mission builder adds some long-term interest, but can't rival the immersiveness of a full dynamic campaign.

Photo-quality aircraft, fluffy clouds, and on-screen instrumentation—visually, this one has it all.

Finally, there's something not quite right with the flight model. Your P-51 feels more like a DC-3, with sluggish response, vague stalls, and gentle spins that seem way too easy to recover from. Force-feedback support is a surprising no-show.

These crucial omissions suggest this is an unfinished title, which is a shame, because *WWII Fighters* appears to be a very promising platform.

MAXIMUM PC VERDICT

Price $50
Company Jane's Combat Simulations
Phone 800.245.4525
URL www.janes.ea.com

6

Combat Flight Simulator

Add machine guns and scripted missions to Microsoft's *Flight Simulator 98*, shake well, and you get a solid, playable WWII sim, hamstrung by an aging code base.

CFS's emphasis, surprisingly, is on flat-out fun. Swashbuckling mission scenarios range from assaulting a secret Nazi island stronghold to dive-bombing Allied landing craft off Normandy Beach.

Aerodynamics on the eight flyable planes have the right historical feel without being overly detailed. You can horse around the sky with only an occasional mild stall. Spins are easily recovered, unlike the hair-curlers in *European Air War*.

There are lots of targeting aids on screen, including text labels for air and ground craft, and a green cone-shaped thing that steers you to the currently selected target. Fixed cockpit views are sharp and useful, but the warped virtual cockpit view, as in *Flight Simulator 98*, is more like a 60's acid flashback than a 40's aircraft interior.

Despite a claimed 1,000 polygons apiece, aircraft have a boxy quality that can't compare to Jane's *WWII Fighters*. Still, they're good by previous standards, with moving control surfaces and translucent cockpits—and framerates rarely dip below the mid-teens.

Combat Flight Simulator lets you toggle off the tactical radar overlay for maximum realism.

Terrain is a strange mix, with near-photographic 256x256 textures incongruously wallpapered onto the traditional *Flight Simulator* pyramid-shaped hills. The upside is a dramatically rolling 3D landscape, which is exploited to the max by missions that have you dodging down deep valleys. Clouds and flak bursts are translucent, but fuzzy. Explosions are gaudy gouts of flame, but done as pasted-on animations without meaningful detail.

On the other hand, *CFS* is the definitive showcase for DirectX hardware support. Direct3D serves up a maximum resolution limited only by your hardware budget, and color depth can reach up to 32-bit. DirectInput provides wrist-rattling force-feedback support. And DirectPlay handles up to 256 players by LAN, modem, or Internet—with free match-up via Microsoft's MSN Gaming Zone.

If you want to flame the tailfeathers off a Messerschmitt without climbing a mile-high learning curve, *Combat Flight Simulator* lives up to its generic title with lots of good, generic action.

MAXIMUM PC VERDICT

Price $45
Company Microsoft Corp.
Phone 415.882.8080
URL www.microsoft.com

7

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Music for the Masses

Four music-mixing software packages that could make you a radio star

Anyone who listens to the radio today knows there's a lot of horrendous music out there. But thanks to a handful of recently released music-mixing apps, you can now create original tunes that sound as professional as what you'd hear on the radio. The following four products don't promise to make you the next Chuck D, but they do give you all the pre-recorded instruments, riffs, and drumbeats you need to rock the world. To get an idea of the musical quality you can expect, check out the MP3s on this month's Maximum CD or on **maximumpc.com** that were created using the apps below.

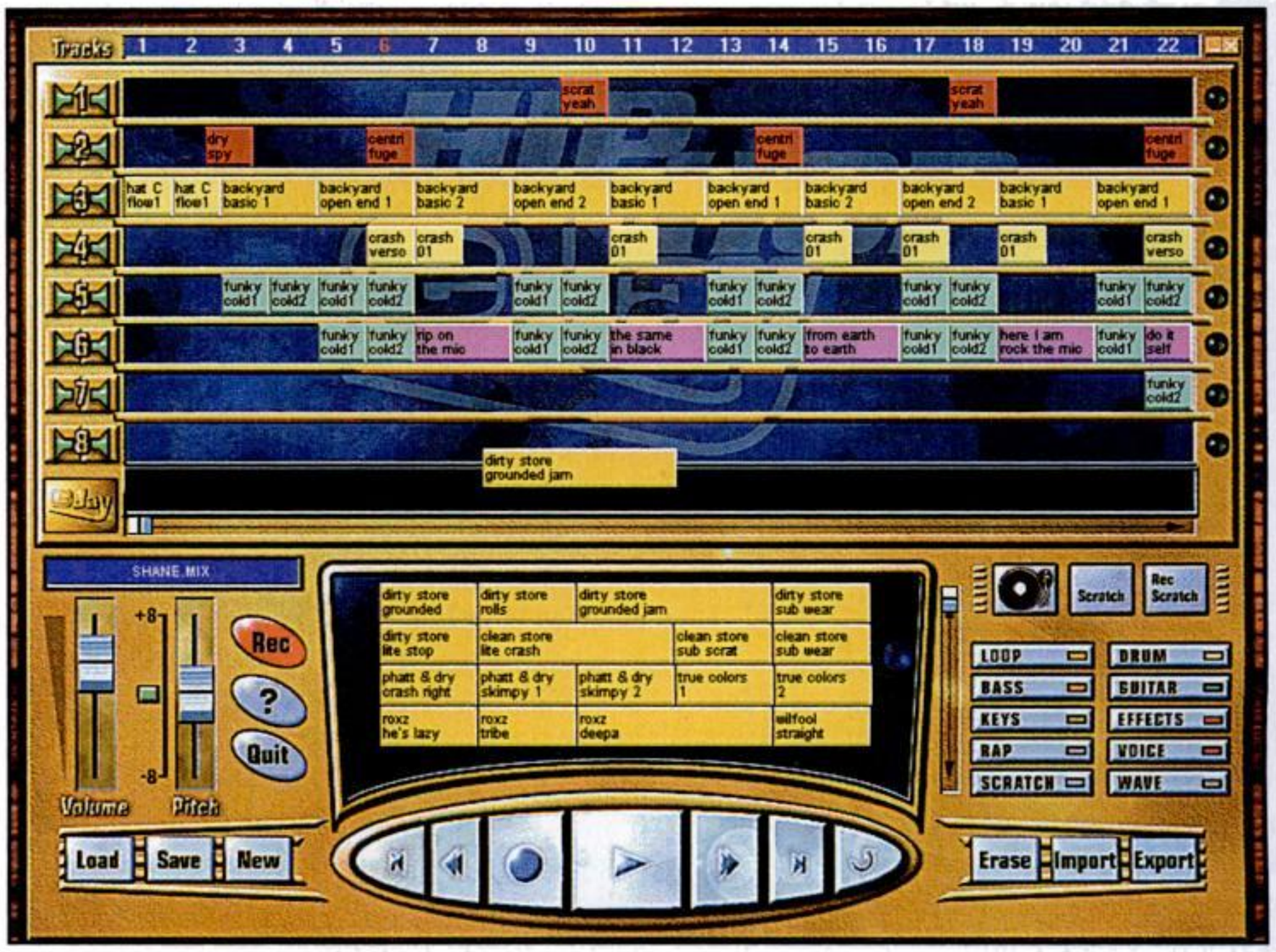
—Shane Mooney

Hip Hop eJay

If you dream of being a kickin' MC, spinning fly beats for the homies, *Hip Hop eJay* is the phat product for you. This eight-track mixer gives you all the beats, rhythms, and scratches you need to pump out the fresh tunes.

For starters, this product has more than 1,300 professionally recorded audio samples, broken down into eight categories: loop, bass, keys, rap, drum, guitar, effects, and voice. Instead of picking actual notes, you pick a series of notes, riffs, and/or effects from the various categories. Loop is a steady drumbeat that can be played continuously throughout your song. Bass is a few notes of bass guitar. Keys include organ, piano, and other keyboard-type grooves. Rap is rhymes; effects are special sound effects such as scratches created with other music machines; and voice is Rap without the rhyming. But country fans take note, you're not going to find any Garth Brooks riffs here; it's all straight-up hip hop.

It's so easy to create songs in *Hip Hop*, it doesn't require a manual. The short, online video tutorial gets you up to speed within seconds. All the sounds are clearly labeled (with labels that actually make sense) and can be listened to with double mouse clicks. Like what you hear? Simply drag and drop that particular sound anywhere in your song and give it a listen. If you don't like a particular sample, it's just as easy to undo. You can erase sounds with ease, drag whole selections to another part of the song, or mix and match different sounds and instruments across the eight available tracks. The program automatically lines up clips at the beginning of a beat, though you can also just as easily move it 1/16th of a beat if you want.



To create your song in Hip Hop eJay, just drag and drop the sound clip anywhere in your composition.

If scratching's your gig, you'll dig the separate Scratch Studio screen, which lets you import any WAV file and scratch to your heart's content, or until you find a sound you want to record for your song. As we listened to our song, we were immediately impressed with the seamless playback quality. And we liked how we could easily tweak the song's pitch and volume.

Once your masterpiece is finished, you can save it and export it as a WAV file to put on your latest demo tape or CD. Now you're ready to send it off to Gangsta Records and sign that lucrative contract that'll keep you and your bodyguard in baggy pants for life.

But, like anything in life, *Hip Hop eJay* has small flaws. While it does indeed have more than 1,300 audio samples, only about 75% of those are really good, with the last 25% just filler. To be fair, you can buy two additional CDs of audio samples for less than $20 each, which gives this title some legs. Its ease of use also means that it compromised on a few features, such as being able to edit or manipulate an individual sound without exporting it into a third-party WAV editor. Finally, if your musical interests are something other than hip hop, you're pretty much hosed.

When you're done with your song, merely export it as a WAV file for later playback.

MAXIMUM PC VERDICT

Price $40
Company Voyetra Turtle Beach
Phone 800.233.9377
URL www.voyetra.com

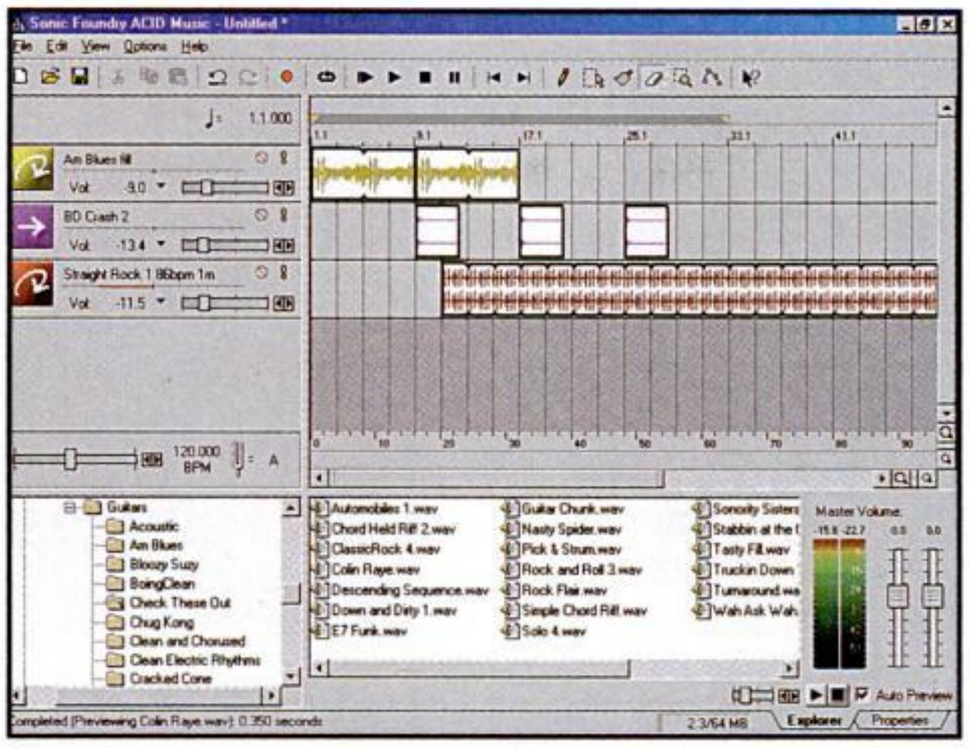
9

Copyrighted material

Acid Music

Acid Music is actually two products in one: a rock music maker and a dance song creator. Unfortunately, while the dance side rocks, the rock side, despite having some of the best riffs and licks of any song maker, leaves plenty to be desired.

To make a song, you first browse the CD using the Windows Explorer-like interface, double-click the clip you want, and then literally paint it where you want it to go. There is a certain amount of editing that can be done to a particular clip—you can erase or draw only the parts of the clip you want to keep, or you can speed up and slow down a clip. For those who want more flexibility, it's easy to link your favorite editing software to this program, which exports the clip automatically.



Despite fewer clips and a seriously lacking rock section, dance-happy feet will be happy with Acid Music.

Whether you want a bluesy guitar strum or an industrial rock sound, you can find it here among the 600 samples, though creating a decent rock song is a bit more difficult. While the guitar riffs in the rock section are all excellent, finding two clips that go together is tough. You can buy additional sound sample discs, but considering the high price of this title, we were expecting more included sounds.

MAXIMUM PC VERDICT

Price $99
Company Sonic Foundry
Phone 800.577.6642
URL www.sonicfoundry.com

7

Studio Pro

For those who think music making is serious business, you'll be happy with *Studio Pro*. Making music with this program is far too much like work to be any fun.

Devoted to those aspiring deejays who sit surrounded by sound boards and turn-tables, composing and re-composing music on the fly, *Studio Pro* is great if you want to entertain the masses while sitting at your computer. But if you want to actually make and easily edit a song, this program is as clumsy as they come.

Studio Pro forces you to use four separate screens to create your song.

The first of four separate screens (!) is a dual turntable where you select one of 16 tracks and then select from a woefully inadequate library of samples and proprietary loops. Once you've given everyone a slot, you hit play and use the pre-assigned keys on your keyboard to play back the music, inserting the sample where you want in realtime.

Naturally, you can record your free-form song, then edit it later in an entirely different screen. Although it offers tools similar to the other programs, editing is too difficult, cumbersome, and just plain infuriating. For example, if you come in a bit too early with a particular track, the only way you can really fix the problem is to re-record the song. And while you can cut and paste clips from within your song, it's nowhere near as easy to compose as the other programs.

Though it has the largest selection of complex manipulation effects and an excellent recording section, *Studio Pro* makes creating a song too much of a chore to be enjoyable.

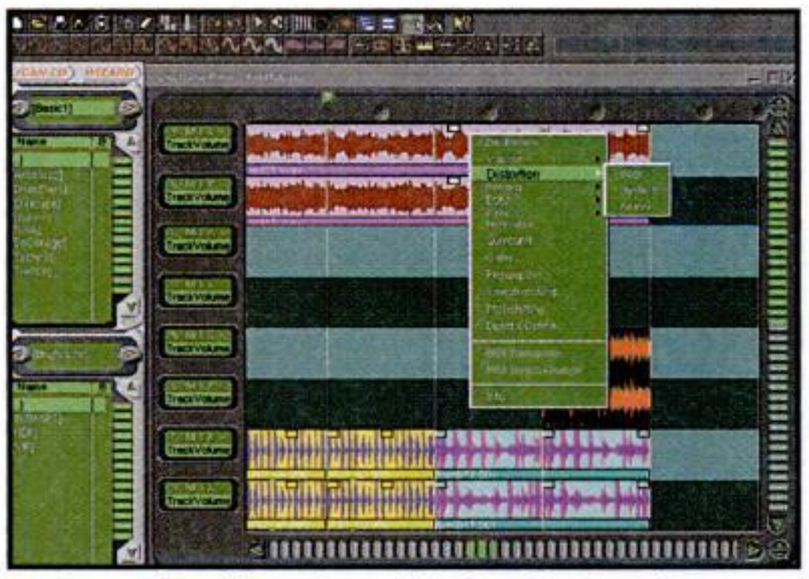
MAXIMUM PC VERDICT

Price $90
Company Mixman Technologies
Phone 800.464.9626
URL www.mixman.com

4

Music Maker Deluxe V2000

One would naturally think that, because it ships with three CDs, there's plenty of music to be had from this particular title. You'd be partially correct. Because *Music Maker* covers so many different musical genres—from acid jazz to speed garage—you don't get enough material within one category to create compelling songs. But that's not the worst part. While *Acid Music*'s clips were far too dissimilar to make a coherent song, most of the clips here are too similar. In trying to compose an acid jazz tune, we found the seven sax solos so similar that we couldn't string them together without creating repetition.


Music Maker offers a host of audio effects such as volume, distortion, and reverb without having to use third-party software.

Music Maker is even more robust than *Acid Music* in that you can edit an audio clip right on the spot. By right clicking on a clip, you can reverse, distort, and increase/decrease the volume. Our favorite feature was the tempo/sample adjuster, which automatically resamples clips to match a selected tempo. And for those who want even more loops, Magix sells ten additional sound discs broken down by genre as well as beats per minute.

Despite its shortcomings, *Music Maker* will attract aspiring Fatboy Slims because of its sheer number of music clips, relative ease of use, and powerful editing features.

MAXIMUM PC VERDICT

Price $90
Company Magix
Phone 310.656.0644
URL www.magix.com

7

Copyrighted material

It's April 15th

Do you know where your tax software is?

The upside to the whole presidential impeachment process isn't watching the political shenanigans of the characters involved, it's the fact that Congress has been too busy to raise our taxes this year.

Come what may for our system of government, we still have to pay our taxes come April 15th. But what once was a Herculean task only somewhat less daunting than committing ritual Hara-kiri, now is only an annoying chore thanks to the release of do-it-yourself PC tax software.

And while tax software comes and goes, two packages have managed to come back year after year, each incarnation being better than the last.

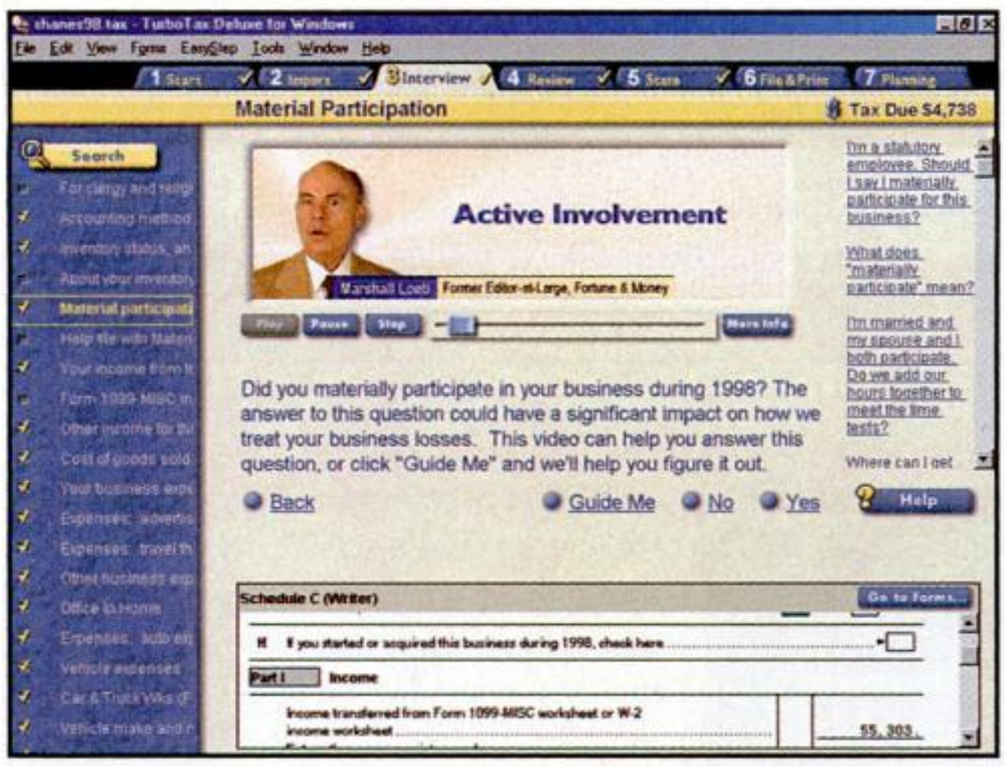
—Shane Mooney

TurboTax Deluxe

TurboTax takes you step by step through filling out your tax return in the excellent Interview section, and then custom tailors the session depending on the answers you give.

For example if you said you're self-employed, it would bring up all the questions, information, and forms necessary to perform the usually complicated task of reporting such income, doing so in easy-to-understand language. The Deluxe version also boasts full-motion video of tax gurus to help explain tricky tax topics, though to be honest, much of the information was superfluous.

The improved interface is divided into thirds, which makes everything easily accessible. In the middle of the screen you get your interview questions. If, after finishing a certain part of the return, you want to jump quickly back to another section to re-enter your subscription to *Maximum PC* as a, ahem, business expense, move your mouse to the left, where your entire return opens up, broken down in layman's language so you can then jump to business expenses. All the while, a little box in the upper right lets you know of your running refund (or, God forbid, tax owed) with every entry.


shanes98 tax - TurboTax Deluxe for Windows
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Active Involvement
Marshall Loeb Former Editor-at-Large, Fortune & Money
Play Pause Stop More Info
Did you materially participate in your business during 1998? The answer to this question could have a significant impact on how we treat your business losses. This video can help you answer this question, or click "Guide Me" and we'll help you figure it out.
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Help
Schedule C (Writer)
Go to Forms
H If you started or acquired this business during 1998, check here
Part I Income
Income transferred from Form 1099-MISC worksheet or W-2 income worksheet
55,303

You didn't buy that CD-ROM drive for nothing. The Deluxe version of TurboTax boasts full-motion video clips that help explain some stickier problems you might face doing your taxes.

Make no mistake; this is a brilliant tax program. It's extremely easy to use, and unlike previous versions, it holds your hand every single step of the way, making it nearly impossible to misunderstand what needs to be done next, no matter how taxing your situation.

MAXIMUM PC VERDICT

Price $50
Company Intuit
Phone 800.446.8848
URL www.turbotax.com

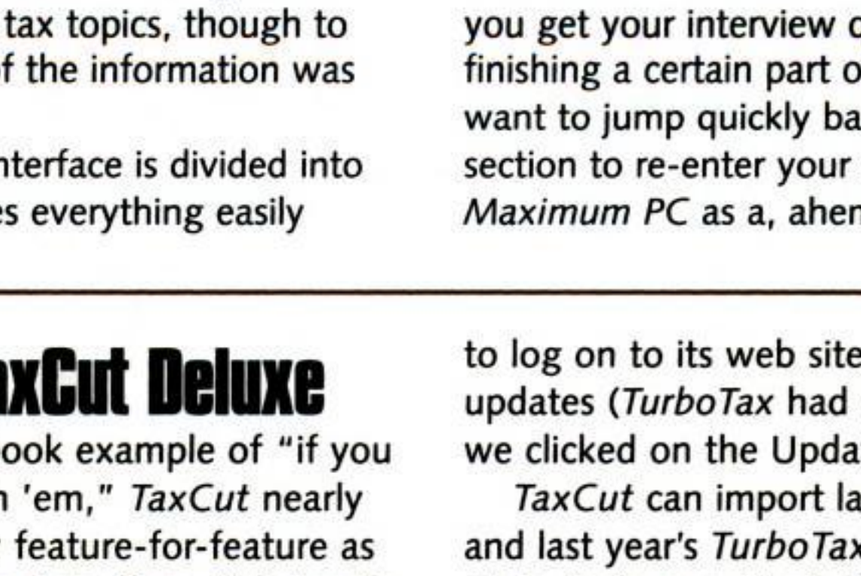
9

Kiplinger TaxCut Deluxe

In an almost textbook example of "if you can't beat 'em join 'em," *TaxCut* nearly matches *TurboTax* feature-for-feature as well as interface-for-interface. But despite this, it's like comparing a Lexus to a Ford. While at first they may seem to have all the same parts, for those who spend any time with both, *TurboTax*'s quality shines through.

The first sign of trouble was *TaxCut*'s inability to log on to its web site to download any updates (*TurboTax* had no problem when we clicked on the Update button).

TaxCut can import last year's return and last year's *TurboTax* return (*TurboTax* sticks to its own kind). Like *TurboTax*, you're given a tax interview, which asks all the requisite questions. For the first part it does an admirable job of keeping things simple and straightforward, with some screens even being a bit friendlier than *TurboTax*'s. But if you deviate from a normal 9-to-5 job, things get confusing. Questions become too straightforward without enough handholding.


Prepare 2 Review 3 File
State Refunds
Introduction
Quick Start Guide
The fastest and easiest way to do your taxes.
For a quick introduction to TaxCut, click Play.
To begin preparing your tax return, click Next.
HELP
Interview
Forms
Planning
Navigator
Back Next
Whole Form
us to enter your phone number on Form 1040 or Form 1040A. The IRS says entering the phone number is optional, but some states require it.
X here if this is a foreign address (not APO/FPO). See Explain This Form.
If you live in California, do you live in one of the following counties: Alpine, Amador, Butte, Calaveras, Colusa, Contra Costa, Del Norte, El Dorado, Glenn, Humboldt, Lake, Lassen, Marin, Mendocino, Modoc, Napa, Nevada, Placer, Plumas, Sacramento, San Joaquin, Shasta, Sierra, Siskiyou, Solano, Sonoma, Sutter, Tehama, Trinity, Yola, or Yuba?
If you live in New York, do you live in New York City, or one of

Like its competitor, TaxCut offers full-motion video. But its video is much snappier than TurboTax's dry talking heads.

TaxCut will review your return and print all the necessary info just like *TurboTax*, and in fact, does just about everything *TurboTax* does at a lower cost, except it does it in a functional way, putting the chore back in preparing your taxes. So if you're comfortable doing your taxes and simply want help in automating the process, *TaxCut* is wonderful. But for the rest of us who think IRA stands for Irish Republican Army, *TurboTax* is the way to go.

MAXIMUM PC VERDICT

Price $40
Company Block Financial
Phone 800.235.4060
URL www.taxcut.com

6

Copyrighted material

My Name is Lucas

LucasArts has a winner and a loser

Powerful forces have been at work within the depths of LucasArts, concurrently developing both one of the best and one of the worst games of the year. *Grim Fandango* has single-handedly reinvented the adventure genre, while *Star Wars: Rogue Squadron* just about destroyed every ounce of credibility left in the *Star Wars* game series.

Grim Fandango

A zesty dose of film noir steeped in Mexican folklore, *Grim Fandango* is an adventure game brimming with style and charisma. You play Manny Calavera, a down-on-his-luck travel agent looking for his ticket to eternal rest. With eccentric characters, a wry sense of humor, and devious puzzles, *Grim Fandango* delivers one of the most delightfully addictive games of the season.

Awkward scenarios like these add to the charm of Grim Fandango.

Like most adventure games, the characters in *Grim Fandango* have predefined dialogue—you ask prescripted questions and the plot rolls to a linear conclusion. Clever quips and crafty chat keep the game fresh and exciting, and there's enough tension to hook players into completing puzzle after puzzle. Some of these puzzles, however, can be quite enigmatic, requiring creative forethought. With more than 60 puzzles to unlock more than 100 different locations, *Grim Fandango* will absorb many a free weekend. However, due to the linear progression of the game, there's no point in firing it up once completed.

As Manny Calavera, you help the recently deceased to their final destination.

Characters in *Grim Fandango* are polygonal, typically composed of 150 polygons, and can be accelerated through Direct3D. Keyframe animation moves the characters fluidly, and shadows or reflections are cast onto surfaces. Seamless in the game, the interface in *Grim Fandango* is nearly invisible. Manny twists his head and looks at interactive objects, and inventory consists of Manny searching through his pockets.

The game combines LucasArts' flair for puzzles and dialogue, with a visual presentation more akin to *Alone in the Dark* or *Resident Evil*. Professional-quality voice actors deliver high-caliber performances, and extraordinarily cool music perfectly complements the quirky atmosphere. Weaving an intricate story with captivating characters, *Grim Fandango* is a spicy morsel sure to satisfy. Where else would you be able to find disgruntled midgets, flaming demon beavers, and a balloon animal of Robert Frost?

—Dan Simpson

PLUSES
- 3D accelerated
- Strong characters and storyline

MINUSES
- Control can be stiff

THE SPECS
- 640x480, 16-bit color
- Supports Direct3D
- DirectSound

MAXIMUM PC VERDICT

Price $40
Company LucasArts
Phone 415.472.3400
URL www.lucasarts.com

9

STAR WARS: ROGUE SQUADRON

Imagine an entire game based on *Shadows of the Empire's* wacked flight model and you have LucasArts' latest licensing blasphemy, *Star Wars: Rogue Squadron*. Wiggling your joystick and committing wholesale destruction against the Empire has never been more boring or uninspired than this lackluster offering that reeks of license milking.

Playable under Direct3D or Glide, *Rogue Squadron* plies texture-mapped polygons at fast framerates, but ground terrain lacks any visual panache: water is a solid, non-alpha-blended mess, as is the undulating shoreline. Fogging fails to mask terrain redraw, while weapon blasts are nontransparent lines. Viewable in a first- or third-person point-of-view, all your favorite *Star Wars* crafts are good enough, but the accompanying action is limp. Missions and combat are arcade/action oriented, so forget sophisticated flight models or smart wingman AI. If it lights up red on your radar, blast it to kingdom come. That's the name of this game; and boy, is it repetitious and dull, although if mindless arcade flight action is your thing, you *might* get a kick out of it.

God help us, Star Wars Rogue Squadron is yet another stinker in a long line of stinky Star Wars games.

Not even force feedback, new fighters, or John Williams' usual epic scoring can save *Star Wars: Rogue Squadron* from crashing into the bargain bin.

—Andrew Sanchez

MAXIMUM PC VERDICT

Price $50
Developer Factor 5
Publisher LucasArts
Phone 415.472.3400
URL www.lucasarts.com

3

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PLUSES
- Excellent audio quality
- Long battery life
- Small and lightweight

MINUSES
- Doesn't display song name
- No backlight
- Can't reorganize songs once loaded
- No USB
- No support for Windows NT

Diamond Rio PMP300

Take your MP3s on the road

The Rio PMP300 plays MP3 audio files anywhere, ushering in the age of mobile digital audio. At the size of a deck of cards, the lightweight (2.4 ounces) Rio could catch on in a big way. But make no mistake, this is definitely a first-generation effort.

The Rio is made for the road. Since it contains no moving parts—it's just solid-state hardware and integrated memory—the Rio never skips. And a single AA alkaline battery provides juice for up to 12 hours of play.

While Diamond claims the Rio can hold 60 minutes of audio, this requires songs to be encoded at around a low-quality 64Kbps. We found that since a typical five-minute song (requiring 50MB in uncompressed WAV format) shrinks to one-tenth the file size without a noticeable loss in quality when encoded at 128Kbps, we could fit some six to eight songs (35 minutes worth of music) onto the 32MB of onboard flash memory. External memory can be added via a SmartMedia card ($50 for 16MB, or less than 20 minutes), but only the 3.3-volt standard is supported.

The Rio connects via a proprietary cable utilizing a pass-through parallel port adapter. We found it generally clunky and especially difficult to move between systems. MP3 files can be dragged and dropped from Windows, or added via a browser-like dialog box. A 5MB song takes approximately 40 seconds to load.

We love the Rio, but we'd like to see CompactFlash memory support (which would offer up to 128MB of CF1 memory or 340MB with IBM's CF2 Microdrive), a backlit screen with scrolling song-title text, the ability to change song order on the Rio itself, and the ability to copy songs back off the Rio to the PC.

—Sean Cleveland

The first portable MP3 player (shown only slightly smaller than actual size).

THE SPECS

MEMORY
- 32MB onboard

INTERFACE
- 15-pin proprietary cable
- Parallel port adapter

LED DISPLAY SCREEN
- Track number/ time counter
- Current button modes
- MP3 encoding rate
- Volume and battery indicators

DIMENSIONS
- 3½x2½x⅝ inches
- 2.4 ounces (70 grams)

MAXIMUM PC VERDICT

Price $200
Company Diamond Multimedia
Phone 800.468.5846
URL www.diamondmm.com

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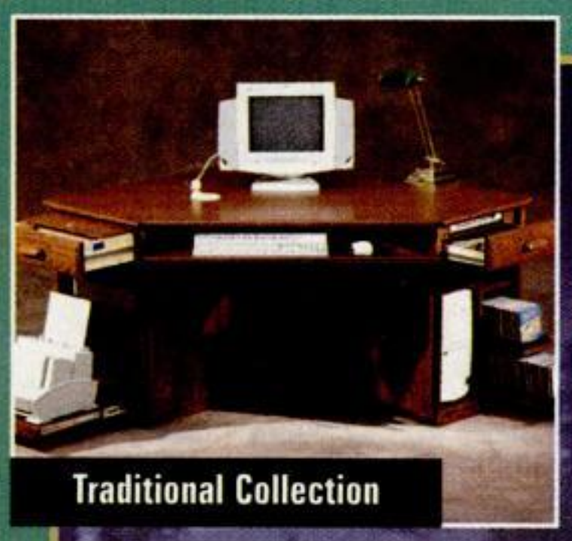

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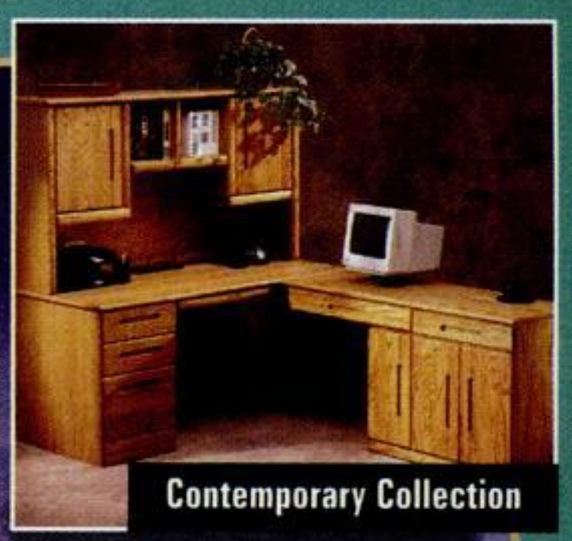

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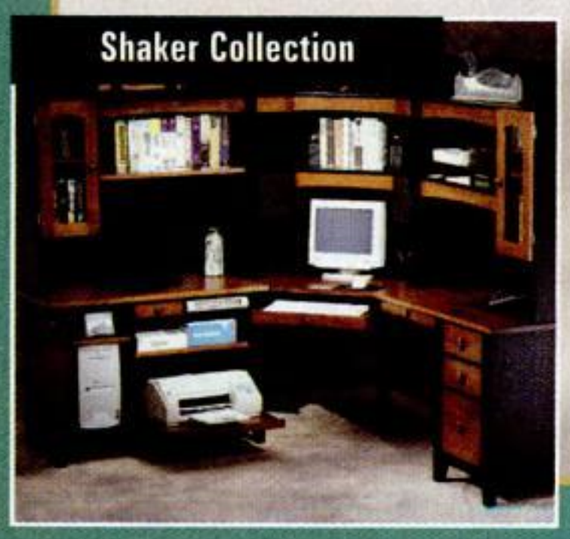

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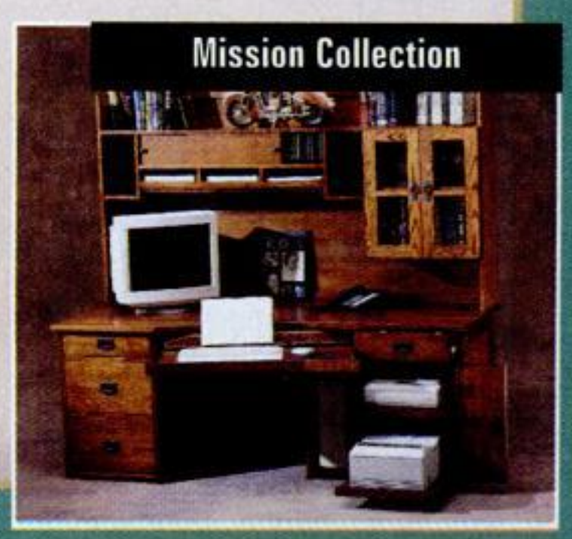

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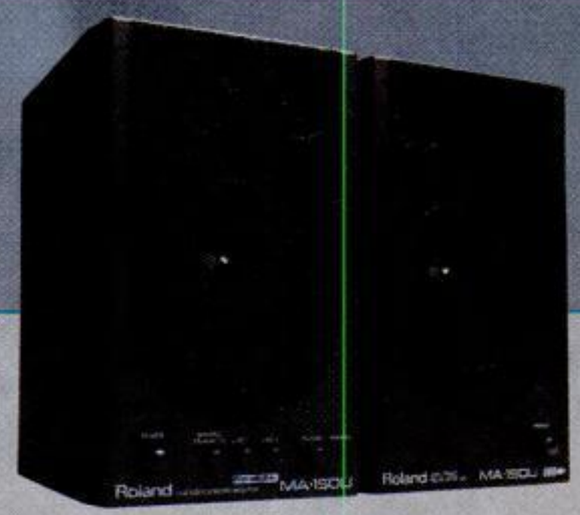

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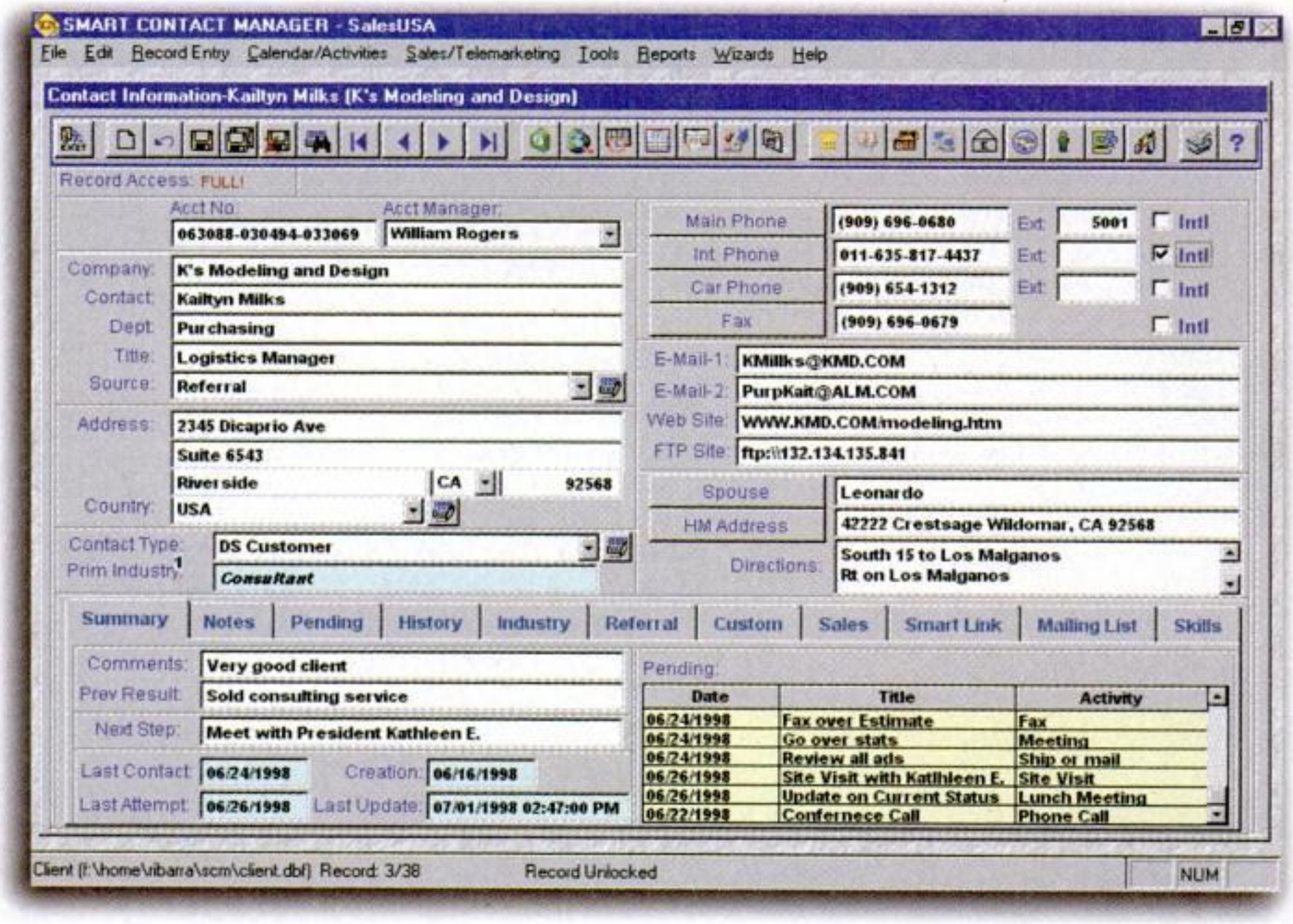
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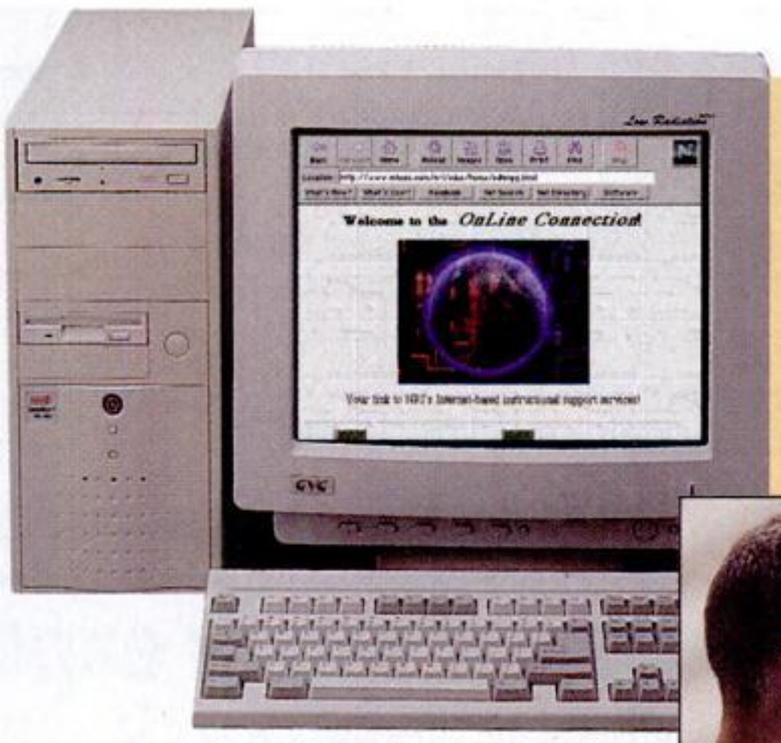

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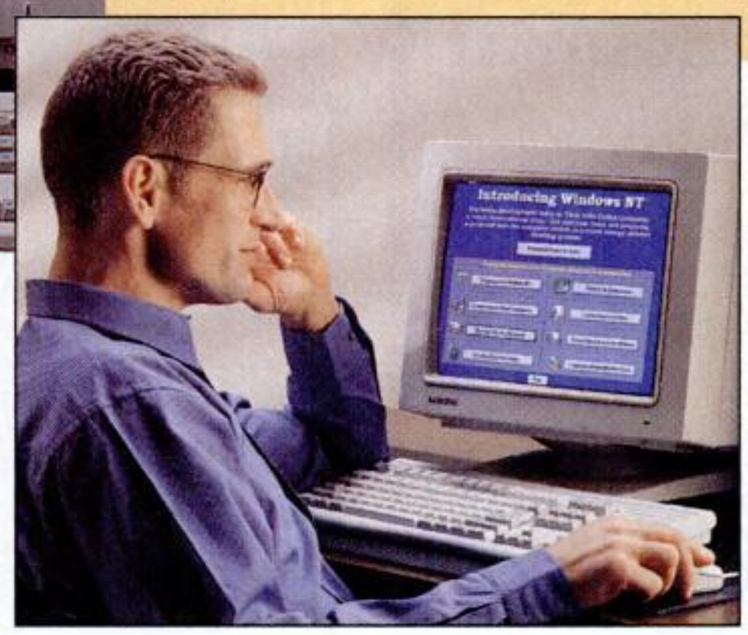

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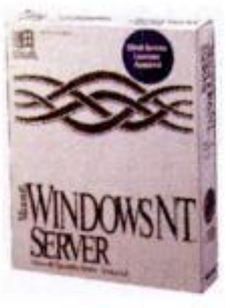

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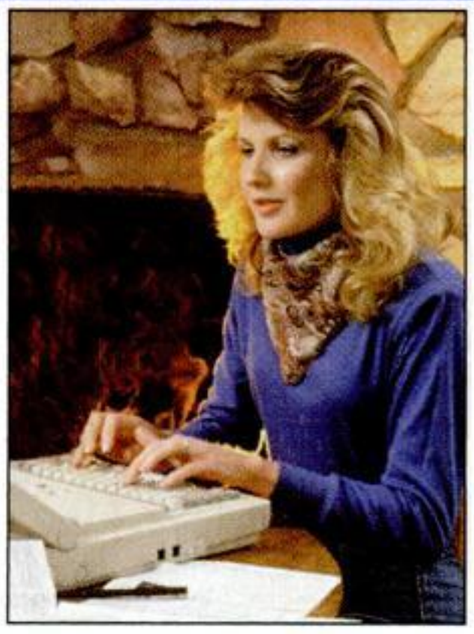

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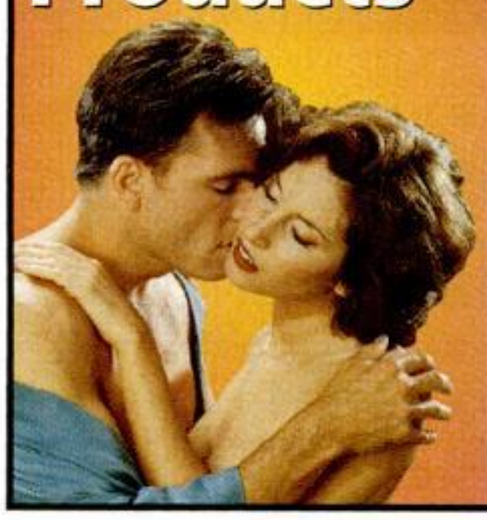

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TERMINATOR

Tech Terms Revealed ▶

Technical terms found throughout MAXIMUM PC are underlined and in blue. Hyperlink back to here for revelation and further explanation. Terms appearing in **blue** within the Terminator are updated definitions of previously explained concepts. The extended Terminator (with terms not found in this issue of the magazine) is also found online at **www.maximumpc.com**.

A

active cooling A processor cooling solution that uses not only passive heat dissipation, but also a fan or similar cooling device to remove heat from the CPU.

API Application Programming Interface. A collection of subroutines—usually part of an operating system—that application programs can call upon to perform common tasks. For example, a program might call an API routine to display a window on the screen. APIs reduce the amount of code programmers have to write.

ASIC (Application Specific Integrated Circuit) Pronounced "A-sick." A custom silicon chip designed for a specific application.

auto-detection A cooperative mechanism of the CPU and motherboard that identifies proper factory default settings. After auto-detecting the CPU, the motherboard can set variables such as voltage, and shut down systems that have been set beyond certain parameters.

B

bin In CPU-speak, a single speed increment as defined by a 0.5 multiplier jump. For example, on a 66MHz system bus, a 266MHz processor (66MHz x 4.0) is one bin faster than a 233MHz processor (66MHz x 3.5).

C

CAV see Constant Angular Velocity

chromakey Replacing a specific color or range of colors, usually a pure shade of blue or green, from a primary video source with part of a second video source. It's how they get the weathermap behind the meteorologist, or Superman to fly over Metropolis.

clock speed The frequency at which a CPU or 3D accelerator chip operates. Measured in megahertz. The faster the clock speed, the more powerful the chip.

CLV see Constant Linear Velocity

Constant Angular Velocity CAV CD-ROM drives spin the disc at a constant speed, so the data rate increases as the pickup moves to the outer edges of the disc. Constant motor speed eliminates the need for settling of the optical pickup after seeking data, resulting in an improved access rate. CAV-based drives are simpler to design and produce because the motor doesn't need to change speed.

Constant Linear Velocity CLV drives vary the speed the disc is spinning at so that the data rate of the drive is constant. The drive rotates the disc faster when reading the inside tracks and slower when reading the outside tracks as more data is pumped through the head. This is to ensure a constant data rate regardless of where on the disc it's being accessed. CLV-based drives generally encounter latency at high-speeds when the rotational speed needs to be changed.

cooked Custom-tweaked for uncharacteristically high performance. A videocard that has been cooked in no way represents the same branded product that sits on store shelves. Final shipping product often must be sold "underdone" to ensure stability and compatibility, and to keep mass-production costs down.

D

Direct3D A subset of Microsoft's DirectX Application Program Interface. This interface allows developers to use hardware acceleration for 3D graphics, which helps games run faster by offloading the 3D processing onto a dedicated piece of hardware.

Document Type Definition A file associated with an XML document that defines the format of the document's tags. XML is an extensible metalanguage that allows anyone to define new tags, so a DTD declares how those tags should work. An XML document can refer to a public DTD at any URL on the Internet.

driver The closest layer of software between an operating system and a piece of hardware. It's often what makes or breaks your OS.

extended partition The secondary DOS partition on a drive. The extended partition is not formatted, it only contains information about the logical drives it supports.

F

file format The specific way data is arranged in a file. When a word processor saves a text file, for example, it usually doesn't save only the text—it also saves formatting information. Different programs do this in different ways, which is why it's often difficult or impossible to exchange files between programs.

fill-rate The number of pixels that a videocard pumps on screen during a fixed span of time; measured in millions of pixels per second.

frame buffer A block of memory for temporarily storing information displayed on the screen. Graphics cards usually have a few megabytes of fast memory for this purpose. The larger the frame buffer, the more resolution and colors a computer can display. 3D graphics cards may also store 3D objects and textures in a frame buffer.

G

Glide 3Dfx's proprietary programming interface (API) for its Voodoo family of videocard accelerators. It's usually faster and easier to program for than Direct3D.

H

HPFS The High Performance File System first appeared with IBM's OS/2 Version 1.2. It handles large drives (up to 2TB and files up to 2GB in size). It also supports long filenames up to 256 characters.

HTML HyperText Markup Language. A standardized set of tags that defines how the contents of a web page should appear in a web browser. Most of the tags describe the appearance of text and the position of graphics. HTML standards are defined by a committee called the W3C (World Wide Web Consortium).

I

integer A whole number, such as 1, 2, 3, etc. Computers can manipulate integers much faster and more accurately than they can manipulate floating-point numbers (fractions), but integers aren't precise enough for some operations.

frame buffer Memory that has been integrated into the 3D accelerator chip's silicon. Typically, this type of memory sits on a PCI or AGP card's circuit board.

interleaved memory Main memory that's been divided into two or more sections, allowing the CPU to access alternate sections immediately.

K

keying laying part of a second video source behind (chromakey or lumikey) or in front of (title key) your primary video source. The part of the video source that is removed ("keyed out") can either be darker than what you wish to keep (lumikey) or of a specific color selected to be removed (chromakey).

L

L2 cache The second-fastest memory available to a microprocessor (second only to the Level 1 cache). It usually consists of SRAM chips near the processor, although some recent processors have on-chip L2 caches. Because the CPU runs faster than the memory bus—say 400MHz vs. 100MHz—cache becomes useful to temporarily store instructions and data, making sure the CPU has a steady supply of material to churn while memory catches up. Also known as secondary cache.

Logical drive A further division of an Extended Partition.

Logical volume What the OS sees as a drive. Logical volumes are assigned drive letters after a high-level (DOS) format has been finished.

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M

Master Boot Record The MBR is a program that exists on the first physical sector of a hard drive and other media such as CD-ROMs, floppies and Zip disks that are used to boot a system. It also contains the Partition Table.

metalanguage A language for designing other languages. XML is an example of a metalanguage for designing document markup languages. It's derived from SGML, a more complete metalanguage.

multiread CD-ROM and DVD-ROM drives adhering to this specification can read commercial CDs (both data and audio), gold CD-R discs, and rewritable CD-RW discs (with both fixed- or variable-packets).

N

NLE Nonlinear Editing. The ability to drop a video or audio clip between two other clips, as opposed to "linear editing" where you can only add clips after previous ones.

NTFS The New Technology File System is used solely by Windows NT. It uses a Unicode character set and supports long filenames up to 255 characters. It's strength lies in complete "government level" security and the ability to recover from crashes. It's also a pure 32-bit file system that cannot be seen by OSes using FAT16 or FAT32. It cannot see partitions configured with FAT32 file systems.

O

OEM Original Equipment Manufacturer. Companies that take the raw components and make a final product for consumers to buy. It usually refers to the company that'll make the part you buy—for example, Diamond Multimedia and STB are OEMs who make videocards based on technology bought from chip makers.

on-die Integrated directly into the processor chip itself.

OpenGL Open Graphics Library. An easy-to-use (for programmers anyway) graphics API created by Silicon Graphics. It's generally accepted in the high-end workstation market. In the Windows 9X world, OpenGL plays David to Microsoft's Direct3D Goliath or vice versa.

P

P6 A CPU architecture family, of which the Pentium Pro, Pentium II, Pentium III, Celeron, and Xeon processors are currently members. The P6 core debuted with the Pentium Pro in the first half of 1995. It is defined by a deep pipeline that addresses cache bottlenecks, closely coupled and on-die L2 cache, fixed-length instructions called "micro-ops," and out-of-order execution. For a detailed explanation of these terms, please see our CPU White Paper in the Re:Print section of www.maximumpc.com.

partition table This defines the boundaries of the primary partition, extended partitions and logical drives. It resides in the MBR in Track 0.

partition A logical volume of a hard drive. Partitioning divides storage space into multiple pieces. Each piece is assigned a different drive letter.

PCB Printed Circuit Board. Any one of the familiar green or brown boards that features chips and other types of electronic circuitry. Motherboards, videocards, network cards—they're all PCBs.

pin-outs The collection of pins that attach a chip—such as a CPU or 3D accelerator—to the motherboard. All Sockect 7 CPUs share an identical pin-out array. Conversely, most 3D accelerators have their own custom array. SocketX would create a pin-out array standard.

platform The combination of an operating system and a microprocessor architecture that determines what kind of software can run on a computer. An example of a platform is Windows 98 on an Intel x86-compatible processor. The Macintosh is a different platform because it runs the Mac OS on a PowerPC processor.

R

RAMDAC Random Access Memory Digital to Analog Converter. The chip on a videocard that converts the bits of a digital image into an analog signal. It maintains the color palette and determines refresh rates. The faster the RAMDAC MHz, the higher the refresh rate your system can handle.

S

SGML Standard Generalized Markup Language. A metalanguage for designing document markup languages. Markup languages describe the format of a document. XML and HTML are both derived from SGML, which is an international standard first adopted in 1986. SGML, in turn, descends from Generalized Markup Language (GML), which was invented at IBM in 1969.

stencil buffer A small chunk of closely coupled RAM used for storing data that will be quickly compared to incoming data and changed as needed. A stencil buffer could be used to hold data for simulating realtime changes in a chunk of a scene, such as a mirror or shadows. Any changes can be quickly changed and the output can accurately reflect these changes.

Streaming SIMD Extensions (SSE) A set of 70 instructions from Intel that speed up the Pentium III's floating-point, integer, and memory streaming power. SIMD stands for Single Instruction Multiple Data. This processing strategy tells a single programming instruction to perform the same operation on two or more pieces of data. SSE is similar to 3DNow! but brings more to the table via new integer and memory streaming enhancements. As is the case with 3DNow!, games and applications must be optimized for SSE to take advantage of the performance boosts.

strewn Terms scattered here and there across a page in reckless abandon after staring at techinical definitions in small print for too long.

Super 7 A refinement of the Socket 7 microprocessor interface, which attaches x86-compatible processors to system motherboards. Super 7 can run at 100MHz, 50 percent faster than Socket 7's 66MHz, making it easier for system devices to keep up with the processor.

T

TCP/IP Transmission Control Protocol/Internet Protocol. These are international standards that govern how computers can send information over data networks. The Internet is an example of a network that uses TCP/IP. Local-area networks (LANs) often use different standards.

texture The surface graphics on a 3D object. Without textures, 3D objects look like naked skeletons of polygons. Textures add realism—a brick wall, the skin of a lizard, or the gleaming metal surface of a spaceship. A 3D program stores a texture as a graphics pattern and applies it to the structure of polygons.

3DNow! A set of 21 instructions that speed up 3D graphics and other tasks on x86-compatible processors. The instructions essentially double a processor's floating-point power, which is integral for setting up polygons and lighting effects in 3D games. The games, however, must be coded to leverage the instructions; otherwise, they'll simply make calls to the processor's "normal" floating-point unit. Introduced in 1998 with AMD's K6-2 processor, 3DNow! also has the support of chipmakers Cyrix (National Semiconductor) and Centaur Technology (IDT).

U

URL Uniform Resource Locator. The address of a computer on the Internet, as in "http://www.maximumpc.com". Actually, URLs are aliases for numerical IP (Internet Protocol) addresses, which are more difficult to remember and type in.

V

VFAT The Virtual File Allocation Table is used by Windows for Workgroups and Windows 95/98. It provides 32-bit Protected Mode access and was previously referred to as 32-bit File Access. It's faster than FAT and differs by supporting long filenames up to 255 characters.

X

XML eXtensible Markup Language. A metalanguage for designing document markup languages. Markup languages describe the format of a document. An example of an XML-compliant markup language is Genealogical Markup Language (GedML), which defines a file format for family trees. HTML is another example of a markup language that, like XML, was derived from SGML, the king of markup languages.

Z

z-buffer In a 3D videocard, local video memory is often used to form a frame-buffer, which stores data required by a 3D card in order to properly render a scene onto your monitor. With the advent of texture-mapped polygons interacting in a 3D world in realtime, the need to have a buffer with which to track positioning became a necessity. A z-buffer stores the z-axis value (front to back) of a pixel on-screen—this value is compared with incoming z-value data to determine whether the pixel will be drawn, and how overlapping pixels will be presented. A z-buffer's accuracy is dependent on how the 3D accelerator handles z-buffer calculations, and how much memory is allocated to it. Higher color-depth rendering requires more z-buffer memory, as the amount of pixel information is made larger with more color usage. It speeds up 3D gaming by not rendering the parts of a scene that are obscured by other objects.

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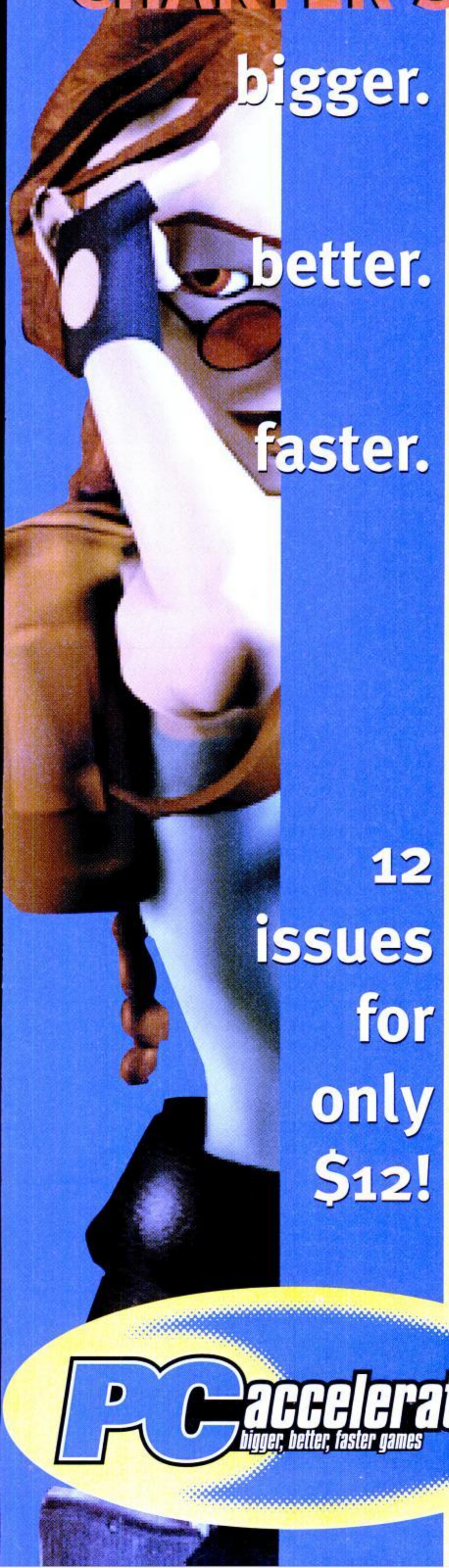

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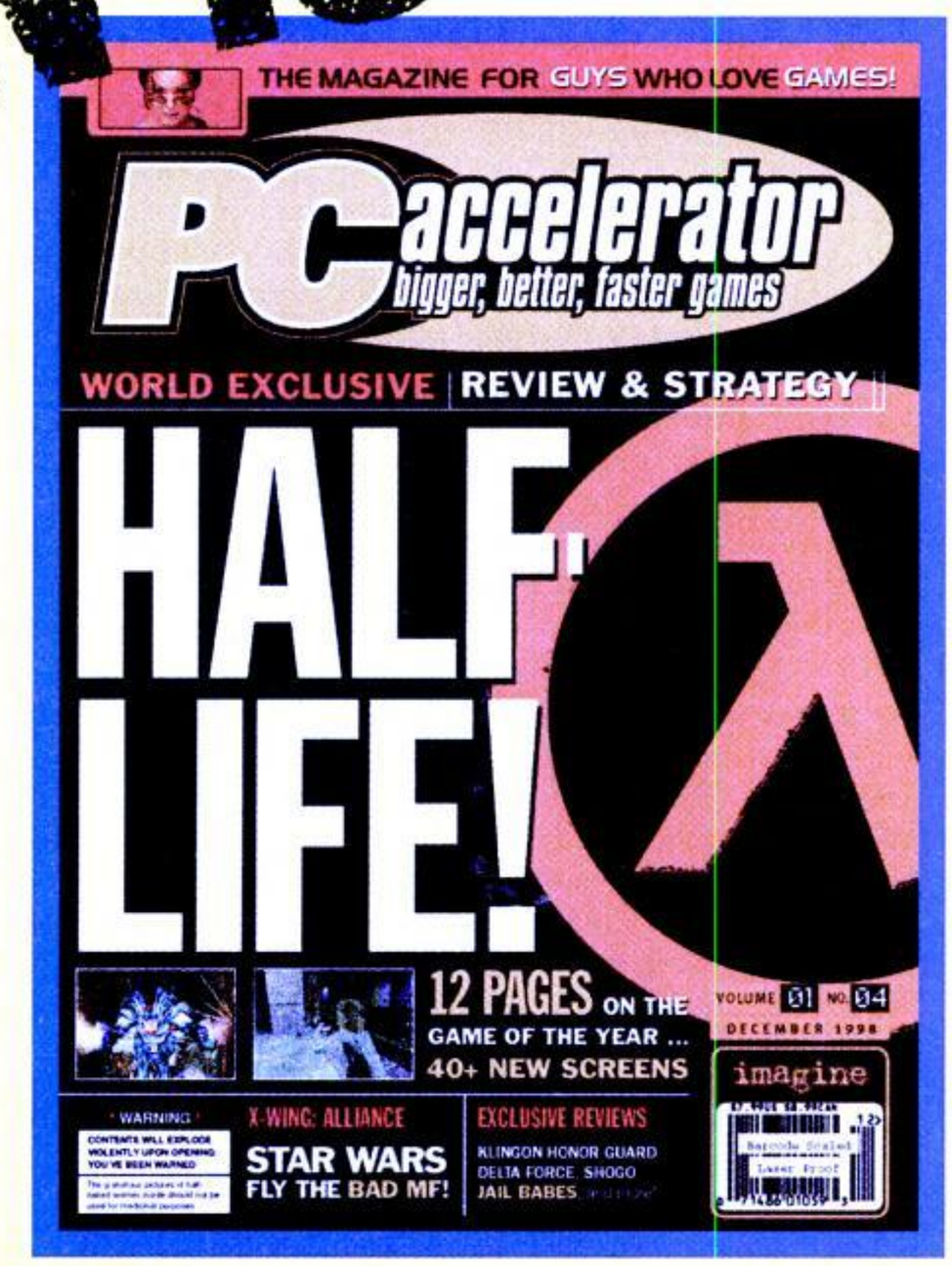

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TECHNOLOGY UPDATE

"We knew the storm was coming before the Park Rangers did"

All Hazards Weather Radio provides continual weather and emergency monitoring and has a variety of helpful features.

by C. Eddie Vernon

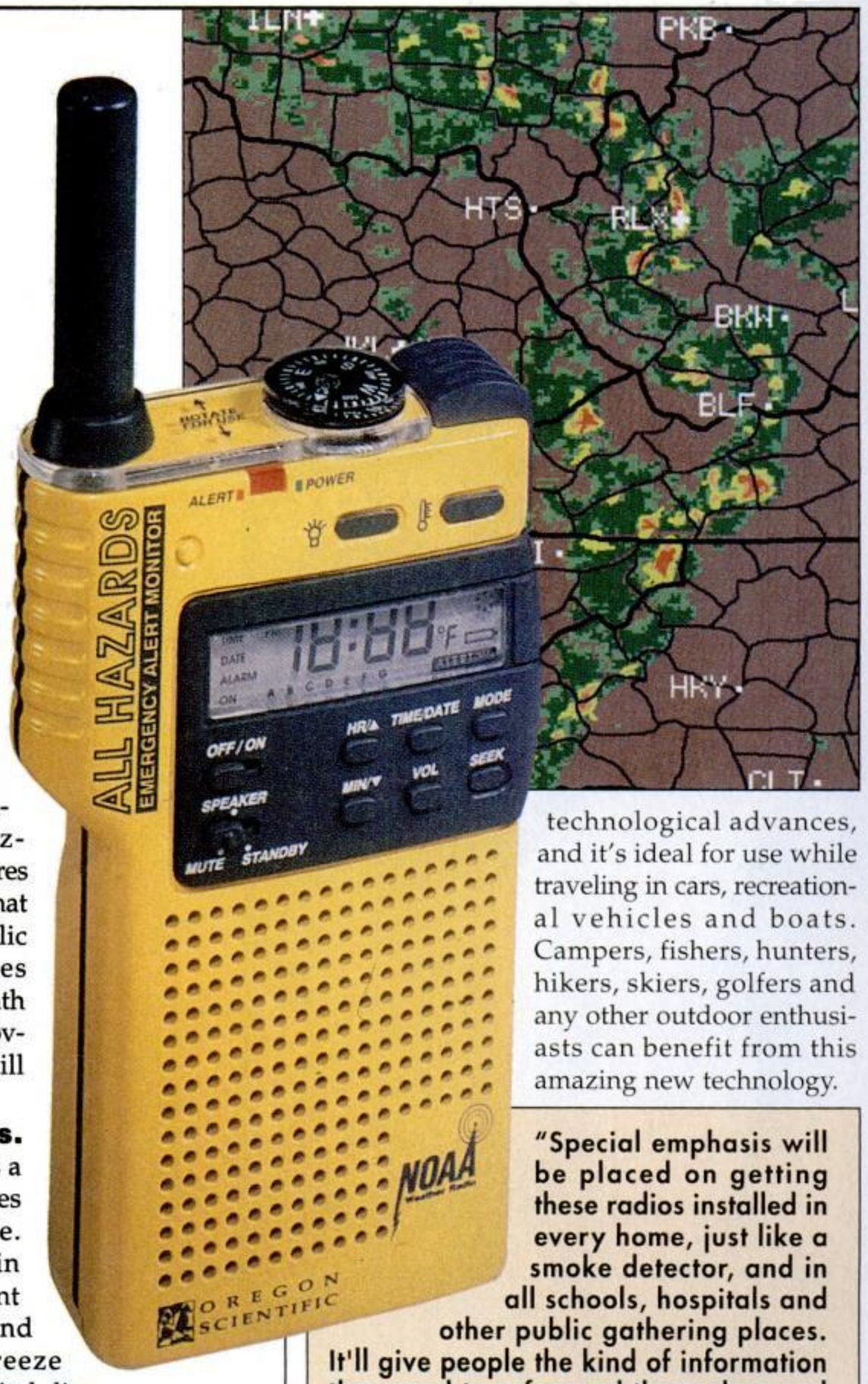
On a recent camping trip, a friend of mine brought along a portable radio he'd received as a gift. Supposedly, it would pick up weather information and broadcasts from the U.S. Emergency Alert System. He brought it along for fun...little did we know how lucky we would be to have it. After we had set out into the woods, a storm system moved into the area, bringing with it a possibility for severe tornadoes. When the red Alert light came on and the loud warning tone sounded, we looked at each other, shrugged and decided to return to the Park Ranger's cabin. Later that night, tornadoes hit the area in which we'd planned to camp. Who knows what would have happened if we hadn't been warned, but one thing is for sure—now I don't go anywhere without my All Hazards Weather Radio.

Lifesaving information. Until now, there has been no single source for immediate, comprehensive weather and emergency information, available to the public, in advance of TV and radio bulletins. Oregon Scientific, a leader in personal electronics, has created a special radio that is ideal for traveling, as well as for campers, hikers and everyone who needs to be prepared for weather emergencies in the great outdoors. It monitors the U.S. Emergency Alert System and automatically seeks all seven frequencies used by the NOAA (National Oceanic and Atmospheric Administration) Weather Radio system. This network broadcasts 24-hour weather forecasts, weather-related travel conditions and warnings about imminent severe weather conditions.

Automatic alert. In the event of special warning broadcasts, the radio's innovative alert system automatically activates a loud tone and a flashing red LED indicator. If the radio is in silent standby mode, it even turns on the speaker. Emergency bulletins might include alerts for tornadoes, hurricanes, earthquakes, ice and snow storms, thunderstorms and other severe weather. Bulletins also cover toxic chemical incidents, oil spills, radiation conditions, hazardous explosions and fires and other emergencies that require immediate public notification. Messages dealing with the aftermath of disasters, such as recovery and relief efforts, will also be broadcast.

Important features. The radio incorporates a variety of special features geared to outdoor use. These include a built-in analog compass, ambient temperature display and an audible/visual Freeze Warning Alert. The digital display incorporates a clock with alarm and snooze controls. A switch lets you turn the speaker to ON or MUTE, or you can set the unit to standby mode. The unit's water-resistant case is rugged and durable, and there's even a built-in belt clip and desktop stand. Its compact, lightweight design makes it ideal for almost any situation, and it operates on 3-AA batteries.

Don't leave home without it. The portable All Hazards Weather Radio was named a winner of the "Innovations" Design and Engineering Award at the 1998 Winter Consumer Electronics Show. This prestigious annual international competition honors outstanding product design achievements. This remarkable new product makes use of the latest technological advances, and it's ideal for use while traveling in cars, recreational vehicles and boats. Campers, fishers, hunters, hikers, skiers, golfers and any other outdoor enthusiasts can benefit from this amazing new technology.



"Special emphasis will be placed on getting these radios installed in every home, just like a smoke detector, and in all schools, hospitals and other public gathering places. It'll give people the kind of information they need to safeguard themselves and their homes during a disaster."

—Vice President Al Gore, speaking in support of the new Emergency Alert/NOAA Weather Radio system.

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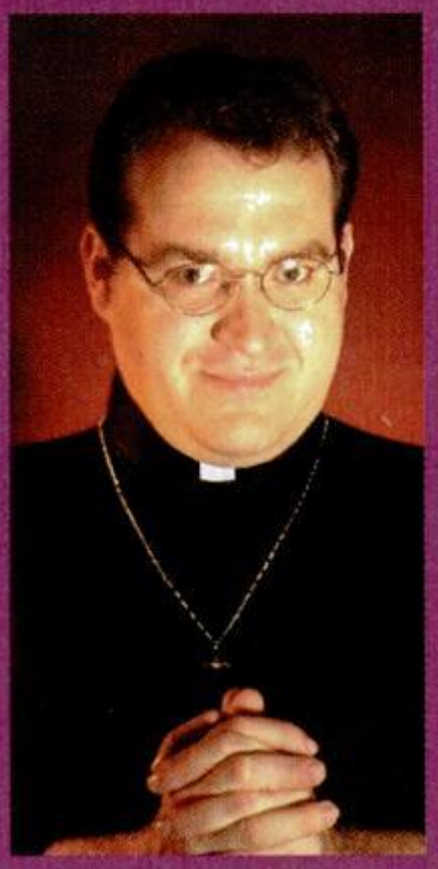

ALEX ST. JOHN was the architect of DirectX while an evangelist at Microsoft. Since leaving the empire, he has remained a player, brokering many deals in the industry. Reach him at **saint@maximumpc.com**.

Fools for Y2K

IT'S NOT THE END OF THE WORLD AS WE KNOW IT

When I told a reader concerned about the Y2K issue not to lose any sleep over it, reader Ingrid Harding e-mailed to call me "very naïve," and said, "You have no idea what's going on, do you?"

Ingrid proceeded to detail the travails Lubbock, Texas, experienced when it set its municipal computer systems to January 1, 2000. There was no water pressure, no electricity, and the planes couldn't take off from the airport. The list went on and on. "You'd better get with the program," she continued. "Even Clinton has put a martial law plan into effect for January 1, 2000, as has Canada. Billions of dollars are being spent to fix this problem to no avail. There are simply too many millions of computers out there to reach in time. I suggest you change your tune soon and start to research the issue responsibly."

To which I replied, "Ingrid, you are a hysterical alarmist spreading FUD. The greatest damage the Y2K bug will cause is fomenting apocalyptic fears among the computer illiterate and the reasoning challenged."

Prior to this, I assumed Y2K hype was just a gimmick for generating news and selling consulting services. I didn't realize it had become a mass hysteria.

While reading an article about how the disaster would effect developing countries the worst because they had the most outdated computer systems, the power went out in the airport where I sat. Although the other tourists panicked, the Dominican locals weren't the least bit fazed. They simply did things manually. The power was still out when we boarded and our plane departed.

Even before the blackout, not a single hotel on the island could get its printer to generate a receipt, and one ineffectual hotel computer let me make hours of long distance calls to the United States without charge. The power outage was just business as usual.

It occurred to me that things were really no different here in the United States: The computers don't work, people don't know how to use the ones that do, and we're so used to it, we don't realize it's a problem... until some marketing genius gives it a catchy name. Suddenly one of the millions of anonymous debilitating computer problems born of ignorance and instability stands out and everybody notices it.

"But Y2K is a special bug!" they argue. This massive bug affects all kinds of different systems, at the same time, and—this is their favorite part—any computer illiterate idiot can understand it! In order to save precious memory, programmers used only two digits to represent the last two years of the date, and on the first day of the year 2000 computers everywhere will run out of dates and the world will end!

Let's address these concerns:

• Y2K is a BIG bug! How do you measure *that*? What percentage of daily computer failures will Y2K represent? I don't know the answer, but nobody can credibly claim it's significant without measuring the impact of all the myriad other crashes. Every time Microsoft ships a new OS it delivers tens of thousands of bugs to millions of computer users. And computer illiteracy adds to the bugcount because it doesn't matter whether it was a programmer's or a user's fault when a computer fails to work. It still failed.

• Y2K happens all at once! Nonsense. Computer systems have to manipulate dates in the future all the time, otherwise your credit cards would have stopped, canned-food expiration dates would be in the 1900s, and the bank would be telling you your home mortgage is one year from being paid off. Many people think that because a computer shows a number as a date, it represents it as one internally. This is rarely true. It's common for large databases to use a constant number that is added to every interval to store dates.

I've programmed old Honeywell and Vax mainframes since I was 11 years old. I wrote accounting systems and databases for banks, and I worked at Microsoft for five years. But what do I know? What does International Data Corp., a respected research company, say about it?

"Disruptions from Y2K will be fairly modest. IDC estimates that only 0.2% of Y2K bugs will cause business-critical problems and that the majority of crashed systems will take hours to days to fix. And fortunately, January 1, 2000, falls on a Saturday. We also predict that Y2K pundits will rapidly discover numerous other computer-programming-related crises."

Computers don't work, people don't know how to use the ones that do, and we're so used to it, we don't realize it's a problem... until some marketing genius gives it a catchy name.

Heck, just because I think it's a huge hoax doesn't mean I shouldn't be able reap some benefit from the hysteria, so I'll make you true believers out there a deal. If I can raise $2,000 in donations before January 1, 2000, I promise to be on a plane to somewhere sunny at midnight New Year's Eve.

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